SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

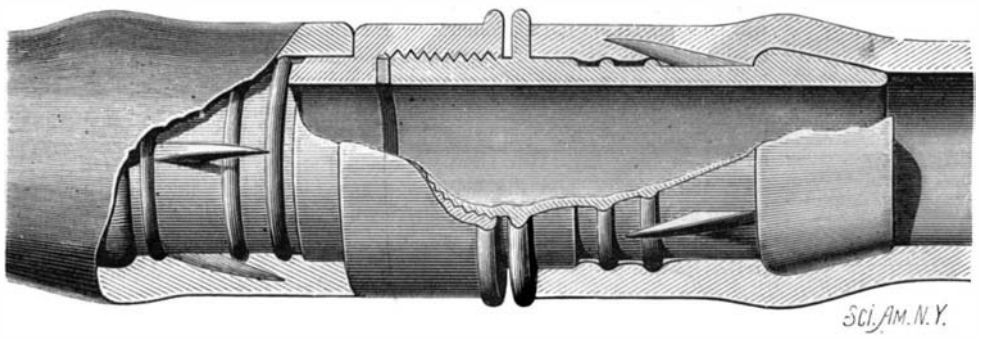
Vol. XLI.—No. 2. [NEW SERIES.] NEW YORK, JULY 12 1879. [$3.20 per Annum. [POSTAGE PREPAID.]

IMPROVED HOSE COUPLING.

The accompanying engraving illustrates a simple and effective device for quickly attaching hose to a coupling. It consists mainly in the inclined spurs which are located at different points in the circumference, but the two circumferential ribs and the conical end assist in holding the hose and insure a tight joint. To attach the hose to the coupling it is only necessary to slip it over the conical end and over the hooks, when it will be retained more securely than by the ordinary devices heretofore used for this purpose.

This contrivance is the invention of Mr. William F. Hofmann, of No. 1232 Thompson street, Philadelphia, Pa.

Communications in reference to the above should be addressed to Charles M. Ghriskey, 508 Commerce street, Philadelphia, Pa.



HOFMANN'S HOSE COUPLING

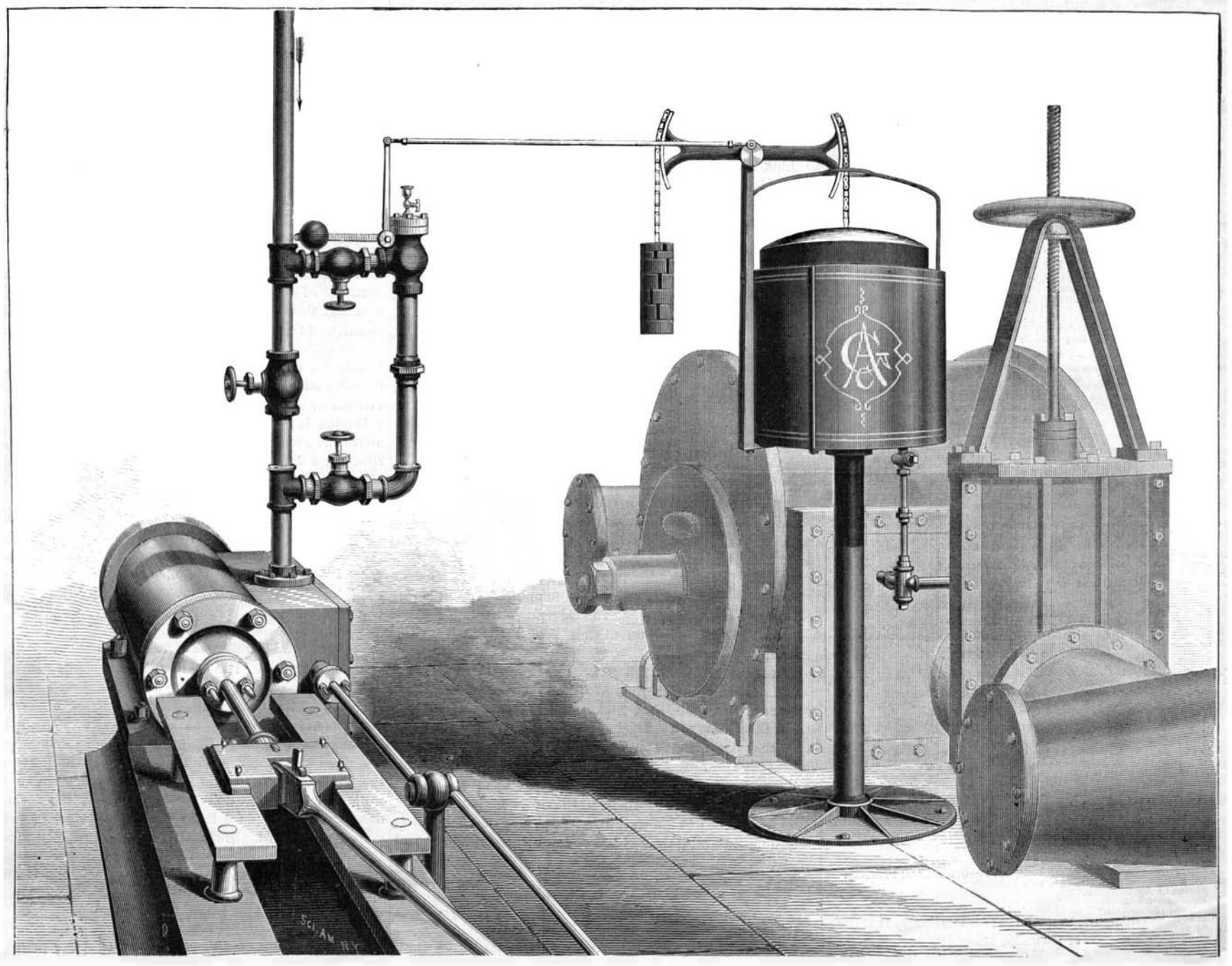
A NEW GAS EXHAUSTER GOVERNOR.

We give on this page an illustration of the Allen governor as applied to the large works of the Gaslight Co., in Boston, Mass. The office of governors of ordinary steam engines is to give a regular speed at varying steam pressure and with changing work. With exhauster engines the case is entirely different: the speed will be irregular, and must vary according to the pressure of the gas. Until recently no one has succeeded in accomplishing this, and the work has practically been done by hand, an engineer being always near by to increase or diminish the speed, according as the pencil on the indicator, or the fluid in the tube, shows the pressure to be greater or less.

A tank about two feet in diameter standing upon a column is placed in a suitable position and at a convenient distance from the engine. Elevated upon one side of this is a nicely adjusted beam with sector ends, one of which is connected by a chain with the inverted cup or gas holder, and the other with weights sufficient to balance it. There is a perforated diaphragm with adjustable apertures across the bottom of the gas holder, which prevents too great movements or changes, and checks the oscillations. A small steel or brass rod runs from an adjustable crank fitted into a slotted trunnion in the center of the beam to another lever connected with a patent Allen balance valve in the steam supply pipe. The tank is partly filled with water to seal the gas. A pipe from the hydraulic main, or in some instances connected with the pipe back of the exhauster, comes up through the bottom of the tank, opening above the water, thus forming a small gas holder within which the pressure is always the same as in the main. Of course the varying pressure causes the bell to rise and fall, and instantly affects the governor valve, causing the engine to go faster or slower, as desired. In practice it is found to give a steadier pressure (the variation rarely exceeding one tenth) than it is possible for a man to do if standing by the engine constantly. The bypath in the steam pipe was put in to prevent possible delays. It has never been used except in the Boston works.

When these governors are used the engineer is not required to be present except to oil his machinery. The saving by keeping the pressure even, to say nothing of the engineer's time, will be great, and will vary, of course, with the amount of gas made. The bell travels about ten inches to open the valve, and works the same in all positions. When once properly adjusted this governor controls the engine perfectly at any pressure of steam sufficient to do the work and with any amount of gas. This governor, which is the invention of R. K. Huntoon, is secured by several patents, and is sold at a reasonable price. They are now in successful operation in the works of the gas companies at Boston, Lowell, Cambridge, Springfield, Brookline, Lawrence, Rochester, N. Y.; Providence, R. I.; Newport, R. I.; Pittsburg, Pa.; Buffalo, N. Y.; and many other cities.

Further information may be obtained by addressing the American Meter Company, Arch street, Philadelphia, or the Allen Governor Company, Boston, Mass.



THE ALLEN GAS EXHAUSTER GOVERNOR.

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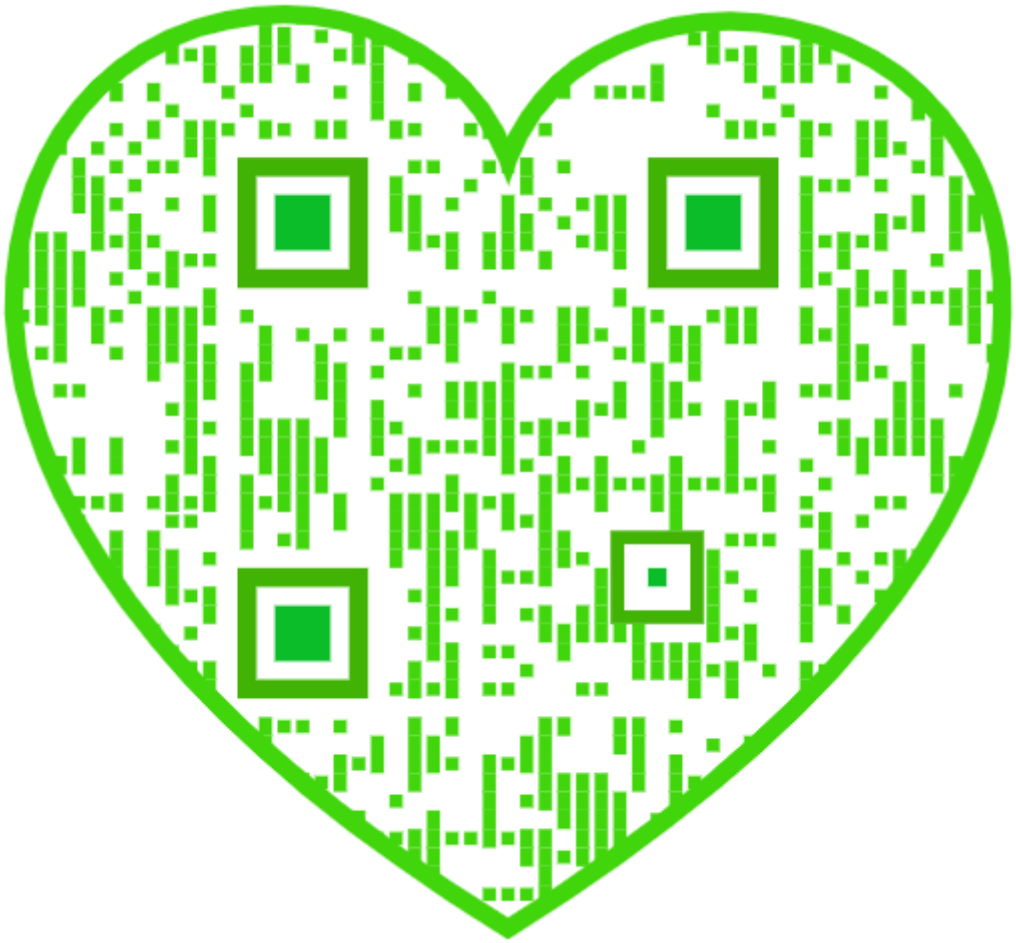

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XLI., No. 2. [NEW SERIES.] *Thirty-fifth Year.*

NEW YORK, SATURDAY, JULY 12, 1879.

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THE NORTH-NORTHWEST.

The development of the great wheat region northwest of Minnesota has wrought a wonderful change in our notions of the climatic conditions of the far northwest. If Governor Couchon, of Manitoba, is correctly reported, there is yet to be made a still more remarkable change of opinion with regard to the country further north, and popularly considered a howling wilderness, with a climate of almost arctic severity.

Speaking of the course of the Canada Pacific Railroad west of Selkirk, at the southern end of Lake Winnipeg, Governor Couchon said that a mistake had been made in laying out the road too far south. Starting at Selkirk, near the 50° of latitude, it had been proposed to run the road north of Lake Manitoba, thence along the North Saskatchewan to Edmonton, on the fifty-third parallel, thence southwest to Victoria. Edmonton, however, proves to be one hundred miles too far south. The climate is milder in the belt of country from two to six degrees further north, around the Peace and Athabasca rivers. Indeed, it is very much warmer around Great Slave Lake than it is at Winnipeg, it being possible to raise wheat, barley, and Indian corn in that region.

This surprising mildness of climate is attributed to the warm winds which blow from the warm Japanese current, moderating the climate of the Pacific coast and the northern interior, as the mild winds of the Gulf Stream do that of England and Western Europe. Owing to the Japanese current the climate of Victoria is as warm as that of San Francisco. In fact, says Governor Couchon, the chromatilla rose, the fuchsia, and the heliotrope grow out doors all winter at Victoria, while on Peace river, between the parallels of fifty-five and fifty-nine, wheat grows weighing 68 lb. to the bushel.

A caravan of surveyors started for Peace river, June 3, and it is expected that in the course of five years or so the Canadian Pacific Railroad will be able to carry American settlers that way almost as far as Alaska. Of the 385 miles of road from Thunder Bay, Lake Superior, to Selkirk, but 175 miles remain to be laid, and 3,000 men are now at work on it. It is to be finished in the spring of 1881, when Winnipeg and Manitoba will have an outlet to Lake Superior. The line through the Red River valley, from Selkirk to St. Vincent, on the border of Minnesota, is already finished.

It is due to the reader to add that Governor Couchon's reporter is the well known correspondent of the New York *Sun*, Eli Perkins.

PLUCK AND ENERGY SUFFICIENT CAPITAL FOR PIONEERS.

We cut the following from the middle of a long editorial in the *Inter-Ocean*. There is truth and sound advice in every line of it, though it may be doubted whether many of those who cling to city poverty are calculated to make efficient pioneers. After bewailing the tendency of men to crowd into the cities and business centers, where the labor market is apt to be overstocked, the *Inter-Ocean* says it is a mistake to think that men without money are without the means required for settlement on wild land. "Every man with energy and muscle and nerve has the means. He can make an honest living out of the ground in almost any part of the West, and do it a thousand times easier than the men who planted fifty years ago, and packed a sack of corn upon the shoulder twenty miles to a mill, or beat it to flour with a pestle. The millions of fertile acres are crying for hands to turn the sod, promising to yield wealth and health and happiness to the occupants of the over-crowded alleys of towns and cities. It would be better for fathers and mothers to make any sacrifice of personal comfort than to raise children in these rank hotbeds of vice, where it is impossible to protect them from its taint.

"If one half the energy and enterprise now displayed by labor unions and protective labor organizations were directed to finding homes upon the unoccupied lands of the West for the thousands who could profitably till them, there would be less occasion for complaint, both from those who would go and those who would stay. A little assistance to enable deserving persons to secure such homes would pay far better than the money spent in sustaining strikes. There are a great many families in Chicago to-day whose best interests would be served, and whose happiness would be increased, if they could be persuaded and aided to leave the busy hum of the city and dig an honest living from the ground.

"There is room enough yet. According to the reports from the Land Office there are 724,311,477 acres of surveyed lands ready for occupants, and nearly twice as much more waiting the surveyor. During the ten years which closed in June, the government sold for cash 57,666,970 acres of land, besides the large grant to homesteaders. If the many hundred thousands who have, with hardship, opened up their new homes, could give their testimony, but few of them could be induced to move into the stifled air of our cities, and attempt to raise their children amid the temptations and vices that would surround them."

Rapid Transit in New York.

According to an official statement of the Manhattan Railway Company the total number of miles of elevated railway now in operation or in process of construction in New York are. Of the New York Elevated Railroad Company, 16 8-10 miles of double track; of the Metropolitan Elevated Railway Company, 24 3-10 miles of double track; of joint line of the New York and Metropolitan Companies, 2 6-10 miles of double track; total, 43 7 10 miles of double track.

The proposed lines in the newly acquired wards in Westchester County, north of Harlem River, would double the total above given. The proposed line through Fourth Avenue and the streets between its southern end and City Hall meets with as little favor from the Mayor as from the public generally, the prevailing opinion being that the city cannot afford to allow Mr. Vanderbilt thus to retrieve at public cost the blunder made in refusing to build a rapid transit road through the center of the island twelve years ago.

The Australian Exhibition.

Information has been received at the Department of State that the period for receiving applications for space in the International Exhibition at Melbourne has been extended to October 31, 1879.

The American Consular representatives in Australia have been instructed by the State Department to pay particular attention to the interests of American exhibitors at Sydney and Melbourne. To represent the United States directly there will be a Secretary or executive officer and two or three Commissioners. The Secretary will have general charge of the American department. Dr. C. C. Cox, of this city, has been appointed to that position. No transportation of goods to the Exhibition will be at the expense of the United States, and no government vessels will be sent with goods. Dr. Cox will open an office in the Department of State to make arrangements and transact business preliminary to his departure.

CONTAMINATION OF DRINKING WATER.

The investigations of the British Health Commissioners discovered that in scarcely one of the beautiful old towns that so delight the traveler in England, was it possible to find a well that was not a source of sanitary peril. The older the town the more thoroughly the soil had become saturated with filth, and the greater the probability of the direct contamination of the drinking water by leakage from privy vaults. The frequency and fatality of typhoid and other epidemics due to filth-contaminated water in some of the most beautiful and, above ground, salubrious towns, gave them a death rate that was simply appalling; yet the inhabitants could scarcely be made to believe that the sparkling water of their wells was little less than deadly

In this country closely built towns are scarcely old enough yet to have the ground they stand on quite so completely saturated with filth; yet the degree of saturation and consequent danger may in many cases be greater than people imagine. The following paragraph from the *Journal*, of Dayton, Ohio, is terribly suggestive, to say the least. That paper says:

"The workmen engaged in the excavation for the new Pruden block, corner of Main and Fifth streets, have developed a state of affairs worthy of serious thought by our citizens. The lot is 99 x 157 feet in size, on which were five double dwelling houses, and the residents were supplied with drinking water from six wells. The soil was embellished with no less than fifty-six vaults and sinks. Can comment be necessary? This may be taken as a sample of the filth saturation of the soil in the older and more compact portions of our fair city. But these conditions are only now and then developed in the march of public improvements, and then passed over without thought. Many of our good people are still disposed to think our efficient board of health is a visionary alarmist in its continued warnings to the citizens and the city council to beware of this monstrous evil under our feet."

Dayton is by no means an old town. Its citizens are above the average in thrift and intelligence. Yet this horrible state of things described seems to have been left to chance to discover. The dimensions of the lot are evidently understated. The area occupied by houses, wells, vaults, and sinks, must have been greater than the area of the new block; yet their proximity to each other must have been at best dangerously close. And there is too much reason to fear that in other towns supplied with drinking water from wells equally disgusting and equally dangerous conditions prevail.

PAH-GOSA SPRINGS, COLORADO.

Beautifully located in the finest part of the valley of the San Juan river, below its rugged mountain course, and just above its entering an inaccessible cañon of cretaceous sandstone, is the great natural curiosity known by the Indians as Pah-Gosa, or Boiling Water. The main spring is described by Lieutenant McCauley as the largest as well as the hottest boiling spring in the United States. Indian trails from all directions converge upon the springs, all deeply worn, the place having been from time immemorial one of great resort. Here, attracted by the healing properties of the water, different families, bands, and tribes, have been accustomed to peacefully assemble, conceiving the springs to be a special creation of the great spirit for the cure of the sick of all tribes, however afflicted.

In the neighborhood of the springs the river is a beautiful trout stream, with a fall of about fifty feet to the mile. The main continental divide is to the north and east, approximating the arc of a circle, with Pah-Gosa as its center.

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A spur of the Snowy Range, or Great Divide, separating the waters of the San Juan and Piedra tributaries, passes to the Southwest, terminating in Pah-Gosa peak, 12,670 feet high—a clearly defined pyramid from the south, and the most prominent point in the landscape. The springs lie on the shortest line of communication from the east to the lower San Juan country. The wagon road from Tierra Amarilla, North Mexico, to the Animas region, passes by them, and though not the shortest route, is the one most traveled, since it alone abounds in wood, water, and grass. It is mainly along the route of the old Spanish trail, the great highway in olden times, leading from New Mexico to the Animas.

The principal springs lie upon the east side of the river in a contracted valley or park, a short distance above where the Animas road crosses the river. They are nineteen in number, and have a temperature above blood heat. They lie in an angle made by a sharp bend in the river and upon its left bank. On the opposite side, half a mile or more to the south, is a group of cold springs near the river. Less than half a mile down the river a small creek flows in from the east, the Ojo Frio, so called from the number of cold springs along its banks. Just below its mouth sharp mesas and masses of vertical cretaceous rocks with wooded summits close in upon the river, forming a cañon not yet explored. The river is well stocked with trout and other fish.

The geological age of the springs is very great. Dr. Newberry is of the opinion that the main spring lies in the crater of an ancient volcano. Originally the mass of rising water had only a surface outlet, pouring forth over the sides of the orifice. The mineral matter which the hot water held in solution was deposited over the surface in thin sheets, forming a great mound mainly of calcium carbonate and sodium sulphate, of greatest thickness near the spring. About the main spring the mass of stalagmitic rock is honeycombed and cavernous, especially on the north toward the river. The entire group of hot springs occupies an area of about 21 acres, on the central and higher portion of the great mound.

The opening of the main spring is an irregular pear shaped depression about 70 feet long by 45 feet wide, the depth being immeasurable, owing to the stalagmitic obstructions beneath the surface. Columns of bubbles rise constantly everywhere over the surface, giving the spring the appearance of a huge glass of freshly decanted champagne. The great basin is divided by a partition capped with a cone of sulphur, from which spurts and puffs a tiny jet of water. Near the center the water boils furiously. The ebullition, however, is wholly gaseous, the water having a temperature below the boiling point at the altitude of the spring The waters rise highly charged with hydrogen monosulphide and carbon dioxide, and contain in solution calcium, sodium and magnesium carbonates, sodium and potassium sulphates, and sodium chloride, the largest mineral constituent being sodium sulphate. Around the eastern edge of the water are a number of cavities which the Indians use as bathing houses. At the southern end is a vapor jet in a cavity, in which the natives extemporize a steam bath by means of a blanket. A series of careful observations in December gave a temperature ranging between 140° and 141° Fah. The outflow is through the honeycombed rock beneath the surface, the line of the flow being marked by openings, many of them emitting vapor. The beds of all outlets of the various springs and openings are coated with mineral matter, largely sulphur from decomposing hydrogen sulphide.

A cantonment for the protection of Southwestern Colorado has been established at the springs, and as an offset to certain claims to the land about the springs, the President reserved, in May, 1877, a square mile, including the springs, as a town site. At a grand council held by the Ute Commission with the Ute bands last fall, the Indians begged that the government should retain possession of the place, so that all persons, whether whites or Indians, might come there and be healed. Lieutenant McCauley expresses the belief that at no distant day these springs are destined to become a place of great resort, and to play no mean part in the sanitary economy of Colorado.

The Central Park Zoological Collection.

The annual report of the Director of the Central Park Menagerie gives the number of animals exhibited during the past year as 1,060, of which 417 were mammals, 616 birds, and 27 reptiles. The additions to the collection during the year were 486, of which 74 were presented, 129 deposited by exhibitors, 20 were born in the menagerie, and 12 (birds) were captured in the Park. The births were: 9 lions, 4 prairie wolves, 2 camels, 1 zebu, 1 fallow deer, 1 hog deer, 1 Mexican deer, with quite a number of white and black swans. Among the animals presented were a sun bear, Sumatra squirrels, and a doe and fawn from Memphis; the last having been sold for the benefit of the yellow fever sufferers and presented to the Park by their purchaser.

The autopsies of animals dying in the Park discovered that an African elephant succumbed to pulmonary congestion, a black bear to chronic peritonitis, a lioness to rupture of the bladder, and an Indian antelope to a distended paunch.

Among the specimens that have survived ten years or more in confinement are several Cape buffaloes, bisons, leopards, pumas, zebus, wapiti deer, and many other mammals and birds.

The animals belonging to the Park are estimated at a value of $12,027; those owned by exhibitors are worth some $51,680. As to the feeding of the collection, 46,713 pounds of meat, 16,356 pounds of bread, 2,197 pounds of fish, and 1,653 quarts of milk have been consumed by the carnivorous animals.

The Director of the Menagerie is Mr. William A. Conklin.

DEFEAT OF THE COCHRANE PATENTS.

In 1863, Mr. William F. Cochrane was granted a patent for a "new and useful method of bolting flour." The improvements claimed consisted in: 1. Bolting the meal over a series of reels, covered with cloth of increasing fineness, in combination with a blast, substantially in the manner described.

2. Running the offal through the entire series of reels, substantially in the manner described, for the purpose of making the flour bolt more freely.

3. Re-bolting the "white middlings" flour after regrinding and mixing them with offal, substantially as described.

4. Conducting the flour made upon each reel into a separate compartment, substantially in the manner described, for the purpose of making a variety of grades, or mixing them in any proportion desired, as set forth.

In the reissue of Mr. Cochrane's patent in 1874 it was described as "a new and useful improvement in the art of manufacturing flour," the inventor claiming:

"The herein before described process for manufacturing flour from the meal of ground wheat by first taking the pulverulent impurities, by subjection to the combined operations of screening and blowing, and afterwards re-grinding and re-bolting the purified middlings."

The assignees of the Cochrane patents promptly brought suit against millers making flour from purified middlings, the claims involved being finally brought to a decision in the United States Court in St Louis, March 17.

The decision by Judge Dillon read as follows: "The reissued patent is a process patent for an alleged new and useful improvement in the art of manufacturing flour. The claim therein, as construed by the complainant, is for the use of five consecutive steps performed in the act of manufacturing flour in a definite order, viz. 1. Grinding the wheat into meal. 2. Taking out the superfine flour. 3. Taking out the pulverulent impurities by the combined operation of screening and blowing, so as to purify the middlings, which are then (4) reground, and then (5) rebolted.

"The real value of the invention described, and claimed in the reissued patent, consists in the purification of the middlings by screening and blowing, thus freeing them from the pulverulent impurities, and thereby fitting them to be reground into flour of a superior quality. The mode described in the patent, and accompanying models and drawings for bolts acting upon the meal or 'chops,' as sieves or screens, assisted in their operation by blasts of air introduced within them. The claim of the complainant is that wheat is ground by the first operation of the stones into meal, so that superfine flour is by the next step of the process taken therefrom, any purification of the middlings in residual mass (of which the valuable constituent is the middlings) by the combined operation of screening and blowing, intermediately, for the purpose of grinding and rebolting, whether such purifying is within the flour reels, or upon vibratory screens outside of reels, is an infringement of the Cochrane patent.

"Flour made from purified middlings is now, and since the year 1871 or 1872 has been, well known throughout the country as 'new process flour.'

"In what consists the essential value of this 'new process?'

"The answer is purified middlings, that is, the making of a first grade of flour out of middlings, from which it had generally been considered by the millers of this country (although more intelligent or advanced ideas prevailed in France, and perhaps elsewhere in Europe) impossible to produce, or, at all events, impracticable, profitably, to produce flour of the first quality.

"A fundamental question in the clause, underlying all others, is: did Mr. Cochrane, in his original patent, granted January 6, 1863, contemplate or provide for the purification of middlings by the combined action of the screen or blast?

"If he did not, the re-issue, which must be for the same invention as the original patent, and which makes the basis of its claim such purification of the middlings, is void.

"In the light of arguments of great ability and thoroughness, extending over a period of fifteen days, and illustrated at every step by exhibits, diagrams, and models, the judges who sat at the hearing have deliberately considered the question above stated, and have reached a unanimous conclusion upon it.

"It becomes my duty to announce the judgment of the court. I shall content myself with stating it without displaying in detail the reasons or elaborating the grounds upon which it rests. The description of the invention in the original patent as a 'method of bolting flour,' the progressively finer meshes in the three bolting reels therein described; the absence of any returns, the statement therein that the agency of the blast is to assist the bolting; the cupola or dome on the model, provided with screens which could have no other effect than to arrest the impurities, or the most of them, and return them directly to the flour, the enforced circuit of air containing any impurities that might escape the screens in the cupola, and returning the air under the conditions specified, laden with such impurities, directly into the reels; the absence of any statement in the patent of a purpose to purify middlings; the absence of any claim for purifying middlings; the statement that air is used to aid bolting, the obvious consideration that if air was used to purify middlings it could not fail to have occurred to so ingenious a mind as Mr. Cochrane's that this could be most easily and most effectively applied, as it is now almost universally applied, outside of the reels, or bolts, and not within them; the failure to provide for blasts of air in the separator; the low grinding which his process evidently contemplated, as evidenced by the successively finer meshes; the fact now established that the manufacture of middlings flour is not practiced without more or less high grinding or higher grinding than was ordinarily used in this country.

"The aforegoing considerations in connection with the extrinsic testimony as to what was done under the patent, all concur to satisfy us that the idea of Mr. Cochrane was the use of the blast in the reels as an aid in the mere process of bolting with the view of obtaining an increased quantity of choice flour, and not for the production of purified middlings. The re-issued patent having been expanded to embrace a claim for purifying middlings, when no such process was described, suggested, or claimed in the original patent, it is void. If this conclusion is sound, it is not necessary to consider the questions of anticipation or infringement, upon some of which, if compelled to decide them, we might not agree. The result is that the bills must be dismissed, and decrees will be entered according." Treat and Nelson, JJ., concur.

Swift's Comet.

On the morning of June 20, at one o'clock, Mr. Swift, of Rochester, discovered a new comet in Constellation Perseus, right ascension 2 minutes 30 seconds, declination north 58°. It was quite bright, with a short tail, and was moving about one degree a day east of north. Observations made at the Sheffield Observatory, New Haven, from the 20th to the 23d, indicate that the motion of the comet is retrograde; also that it had passed its perihelion. It is consequently receding from the sun, though still approaching the earth.

The reporter, "W. B.," under date of June 23, says: As it is a faint object, and likely to increase but little in brightness, it is probable that it will not be visible after this week until the period of bright moonlight is passed. Unless observations enough are obtained this week to enable the preparation of a fair ephemeris, it will be difficult to find the comet when the heavens are again suitable for observation.

A rough orbit computed from the Sheffield observations gave the following places for Washington mean midnight:

	R. A. h. m. s.	N. D.
June 24·5	2 49 50	68° 21′
June 25·5	2 50 40	69° 51′
June 26·5	2 51 35	71° 33′
June 27·5	2 52 20	73° 30′

A later report by Mr. Swift (June 24) states that, contrary to his expectations, the comet, instead of growing fainter, was increasing in brightness. That morning a nucleus was observable for the first time, the comet resembling somewhat Brorsen's. The nucleus appeared to be double.

Will it Pay?

The Fall River spinners' strike began, as threatened, June 25.

By the action of about 800 men the industry of 15,000 operatives has been arrested. The strike will cost the mill hands about $100,000 a week in loss of wages.

The leaders in the strike are described as operatives recently from England, particularly from Blackburn and Preston. It is further affirmed that no person prominent in these difficulties was an inhabitant of Fall River in 1871. One man is particularly described. He is a weaver who can get no employment in any of the mills on account of his bad reputation for causing trouble. He makes a business of agitating. Yet it is stated of him that he keeps his own child working so many hours a day that he has been arrested for a violation of the statute in such cases. A few men of this sort have been allowed by their fellow operatives to stop their work and stop their wages. Will it pay?

A Thousand Dollar Wooden Railway.

We have heretofore described the 18 inch military railway used at Woolwich Arsenal, England; but the narrowest gauge and cheapest railway as yet brought out is that of D. B. James, Visalia, Cal. Two stout bars of wood, so laid as to leave a groove between them, form the track. On this track a wheel with a bulge in the middle of its periphery that fits the groove is used, the wheel having a broad flange at each side of the bulge. One of these wheels placed at each end of a plank forms the car. It is alleged that twelve miles an hour can be got out of a wooden railway of this construction; and that its carrying capacity is very great. The cost is estimated at one thousand dollars a mile.

The Eclipse in 1880.

It is reported that Mr. A. F. Goddard, of Sacramento, California, is planning an excursion party of fifty or more observers, to be stationed along the route of the total eclipse of the sun in California, next January. The grandest points of view will be selected; and it is anticipated that much pleasure as well as scientific profit will result from the expedition.

M. FERDINAND DE LESSEPS, in a lecture at Amiens, stated that the first sod of the Panama Canal would be turned on January 1, 1880, and that with 40,000 navvies, including some Chinese and 15,000 Brazilian negroes, the work would be completed in eight years.

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RECENT AMERICAN PATENTS.

A variety of widely differing subjects are represented in the engraving on this page, showing the great diversity of American inventive genius.

Fig. 1 represents a novel machine intended for aerial navigation, invented by Mr. Henry Badgley, of Fairfax Court House, Va. The boat carries a motor, and has at opposite ends propeller wheels for moving it either backward or forward. A portion of the shaft is flexible, so that the rear propeller wheel may be turned in a horizontal plane for the purpose of steering. From the center of the boat a mast rises, carrying at its upper end a cylindrical balloon, which is well stayed and provided with a safety valve. A sleeve upon the mast supports a horizontal propeller wheel, which receives its motion from the motor. This wheel is intended to supplement the balloon in raising the boat.

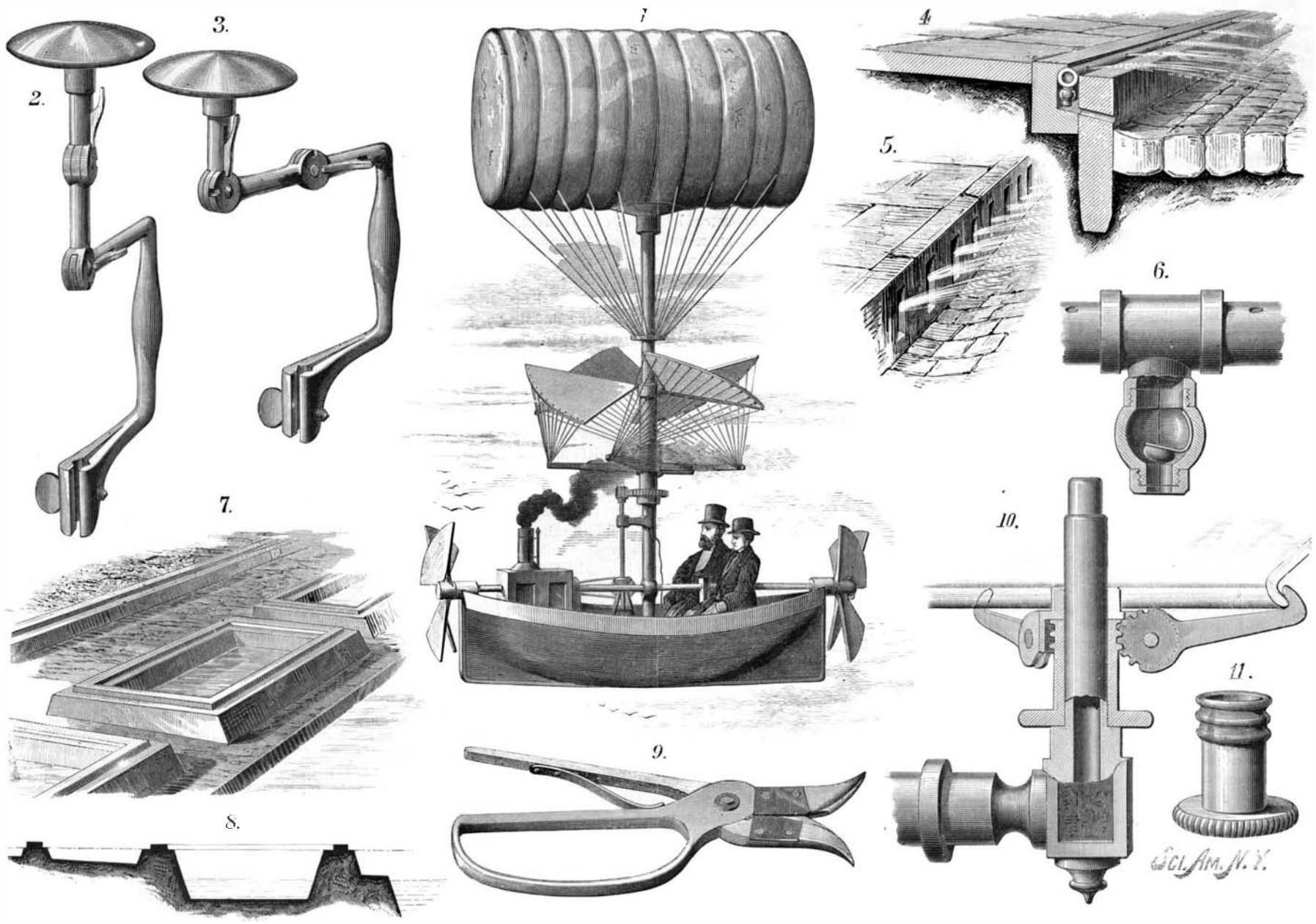
The bit stock, shown in Figs. 2 and 3, is the invention of Mr. Loyd C. De Bert, of San Francisco, Cal. The upper portion is jointed, so that the tool may be used either as an ordinary hand brace or as a crank brace.

Figs. 4, 5, and 6 represent a street sprinkling apparatus, patented by Mr. Dana Mansfield, of St. Louis, Mo. It consists of a water pipe fixed along the curbstone to sprinkle the street from jet holes in the pipe. Two arrangements of the apparatus are shown in Figs. 4 and 5, and in Fig. 6 is represented an automatic valve for permitting the escape of the water remaining in the pipes after the pressure is taken off.

Mr. Hugh O. Ames, of New Orleans, La., has patented an improved method of obtaining pure water from rivers. This invention, which is shown in Figs. 7 and 8, relates to the construction of reservoirs for filtering turbid water obtained from rivers, and it has been especially devised for obtaining water from the Mississippi, which at certain seasons of the year is so charged with alluvial matter as to be unfit for use until filtered. The reservoirs are located in the sedimentary accretions in the river bed, and are combined with levees or walls constructed of sedimentary material, which acts as filtering media as well as for excluding the turbid water from the reservoir when the river is at its highest stage or flood level.

Fig. 9 represents an improved tool for cutting and bending wire, recently patented by Mr. Charles W. Miller, of Sycamore, Ill. It is designed more particularly for cutting and withdrawing the binding wires of grain sheaves. The jaws are flared out to render it easy to grasp the wire, and they clamp the wire as soon as it is cut, so that it may be readily removed from the sheave.

Figs. 10 and 11 represent an ingenious holder for globes and shades of gas burners and other lights, recently patented by Mr. Joseph Breeden, of Birmingham, England. In this holder the arms or claws are made to expand and contract to suit different sized globes and shades, and to admit of readily attaching or detaching the globe or shade. The radial arms are pivoted to ears fixed around the central tube of the burner; and the arms work in vertical planes, so that by bringing them nearer to a vertical or horizontal position, their extremities will diverge more or less. Each arm has a toothed sector, and all of the arms are adjusted simultaneously by a tangent screw or worm gearing with the toothed sectors of all the arms. This worm, which is shown in detail in Fig. 11, rotates on the central tube of the burner, is confined between collars, and is provided with a milled flange, by which it is turned.



RECENTLY PATENTED NOVELTIES.

Exhibition of Sanitary Appliances.

In connection with the annual meeting of the British Medical Association to take place in the Queen's College, Cork, from the 5th to the 8th of August, there will be held an exhibition of sanitary and hygienic appliances.

An address on public health will be delivered by Dr. Andrew Fergus, President of the Faculty of Physicians and Surgeons, Glasgow; and the various meetings and discussions in this department, to which the public will be admitted, will be conducted as far as possible in connection with the sanitary exhibition.

The exhibition will be divided into the following departments: I. Drainage, sanitary appliances, and disposal of refuse. II. Water supply, filtration, and river purification. III. Food, clothing, and disinfection. IV. Sanitary building appliances, plans and models, ventilation, heating, lighting, and consumption of smoke. V. Disposal of the dead. VI. Sanitary literature.

The City of Cork Steam Packet Co., the Clyde Shipping Co., and the Messrs. MacIver, of the Cunard Line, have generously consented to convey exhibits free of freight to Cork by their respective steamships. Under powers conferred by the "Protections of Inventions Act, 1870," the Board of Trade will grant a certificate giving provisional protection to all unpatented inventions. All applications for space should be made before June 30.

A Swiss Exhibition.

Switzerland has appointed the year 1881 for an international exhibition of watches, jewelry, snuff boxes, and musical boxes—a display in which the ancient Republic may well call the rest of the world to see what she can do. This project adds another illustration to the recent tendency of international exhibitions, especially in smaller countries, to run to specialties. This will be the first exhibition of the sort in Switzerland.

Correspondence.

Petroleum in Steam Boilers.

To the Editor of the Scientific American:

Some ten months ago I noticed in your valuable paper an article wherein you strongly recommended the use of petroleum to preserve iron. At that time I had received a new boiler of 8 horse power nominal, which I use for grinding wheat and sawing. Fearful of the result which happened to a boiler I had just condemned after 18 months' use, I determined to give it a thorough trial with refined petroleum, the result of which is most satisfactory, as you will observe by the following:

The water I use is strongly impregnated with lime. Although very clear before used it soon becomes white and thick, and the boiler commences to prime or foam, causing me to run at a low pressure, and an almost constant use of olive oil, injected into the boiler through feed pump (a thing I was often cautioned against by an old English engineer of fifty years' experience), assuring me that oil had a bad effect in the steam chest. I knew of no other remedy, and continued to use it until, at the end of 18 months, my boiler was destroyed. The iron in the steam department had become like a sponge, and I put more than 30 holes through it with a pocket knife; but the boiler I now use I commenced by thoroughly wetting inside with petroleum before filling. I work on two weeks, blow off the water, scrub clean with brooms, throw in straw in firebox, and warm the boiler with slow fire, and when perfectly dry I again wet down thoroughly with refined petroleum, and up to writing not the least incrustation has formed on the boiler, and no priming or foaming is ever seen; and instead of having to spend two days every two weeks to go all through the boiler with chipping hammers (a thing detestable), twenty minutes only is required with a scrub broom. Fuel is saved, time is saved, and my boiler is preserved, and I feel under lasting obligations to you for the hint.

I use about half a gallon of petroleum at each wetting down, and for days I see the petroleum bobbing in the gauge glass and all going smoothly, and I am almost of the belief that petroleum will make a boiler do most anything but talk.

I notice in your April number that J. R. F. inquires if petroleum has ever been used in marine boilers as a preventative for priming. From the experience I have had with it there is nothing to be feared but good results.

JOHN COBB.

United States Vice-Consulate, Casablanca, Morocco, June 5, 1879.

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A MAGNETIZED WATCH.

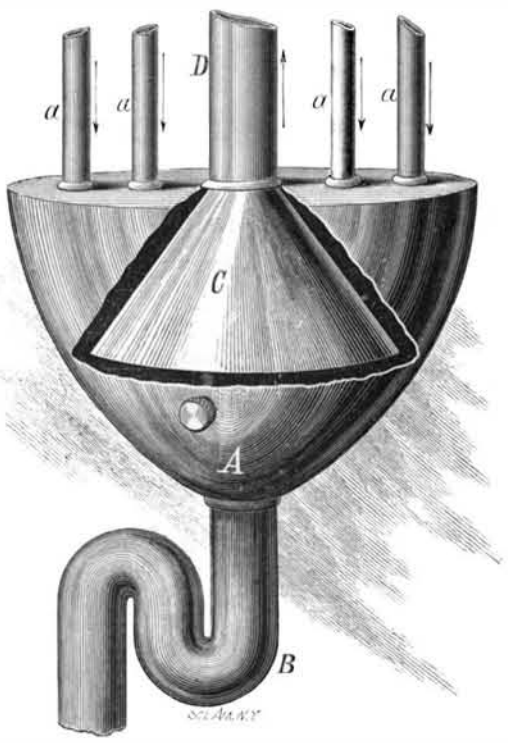
A lady in Madrid, Me., who carried a valuable gold watch, was in a house last summer when it was struck by lightning. The watch stopped at the time, and, although jewelers have repeatedly examined it and pronounced it perfect in every particular, it cannot be made to move. It is so magnetized that watchmakers say no part of it could ever be made to do duty if taken out and put into another set of works.—*Springfield (Mass.) Union.*

We venture to say that no watchmaker who reads the SCIENTIFIC AMERICAN would say that a magnetized watch cannot be perfectly restored. By the use of a magnet any watch that has been magnetized can be very easily demagnetized and the timepiece restored to its former usefulness. We will give an article on this subject before long from the pen of an esteemed correspondent, showing how to demagnetize a watch, with other interesting facts connected with the subject of demagnetization.

A NEW SEWER TRAP.

We give herewith an engraving of an improved sewer trap recently patented by Mr. Thomas J. Fales, of 118 Liberty street, New York. It consists of a sewage receptacle, A, connected with a goose neck water trap, B, and having a closed top into which the drain pipes, *a a a a*, are inserted.

Within the receptacle, A, and above the mouth of the



FALES' SEWER TRAP.

trap, B, there is an inverted funnel, C, connected with an exhaust pipe, D, leading to the roof of the building, and surmounted by a ventilator, which causes an upward draught of air and removes any gases that may rise from the trap, B, or accumulate in the receptacle.

The pipes, *a a a a*, which discharge into the receptacle, A, should each be provided with an S trap. With this improved trap applied it would seem impossible for gas to enter a house, and should a leakage occur in any of the smaller pipes, *a*, they may be removed or repaired without the escape of gas from the sewer pipe.

Further information may be obtained from the inventor, whose address is given above.

RECENT MECHANICAL INVENTIONS.

An improved tool for punching holes or slots in leather straps, for the insertion of the buckle tongue, has been patented by Mr. Bartless Bohonon, of West Farlee, Vt. It consists in a hand punch fitted with a revolving head that carries cutters of different sizes.

Mr. George O. V. Roedern, of Indianola, Texas, has patented an improved piano action, the principal working and supporting parts of which are made of sheet metal. Although its construction is quite simple it cannot be readily described without an engraving.

An improved device for stretching the toes of boots and shoes has been patented by Mr. William Nagle, of 229 Grand street, Brooklyn, E. D., N. Y. It is so contrived that it may be applied to various sizes of boots and shoes. It is quite simple, and is a desirable instrument for dealers in boots and shoes.

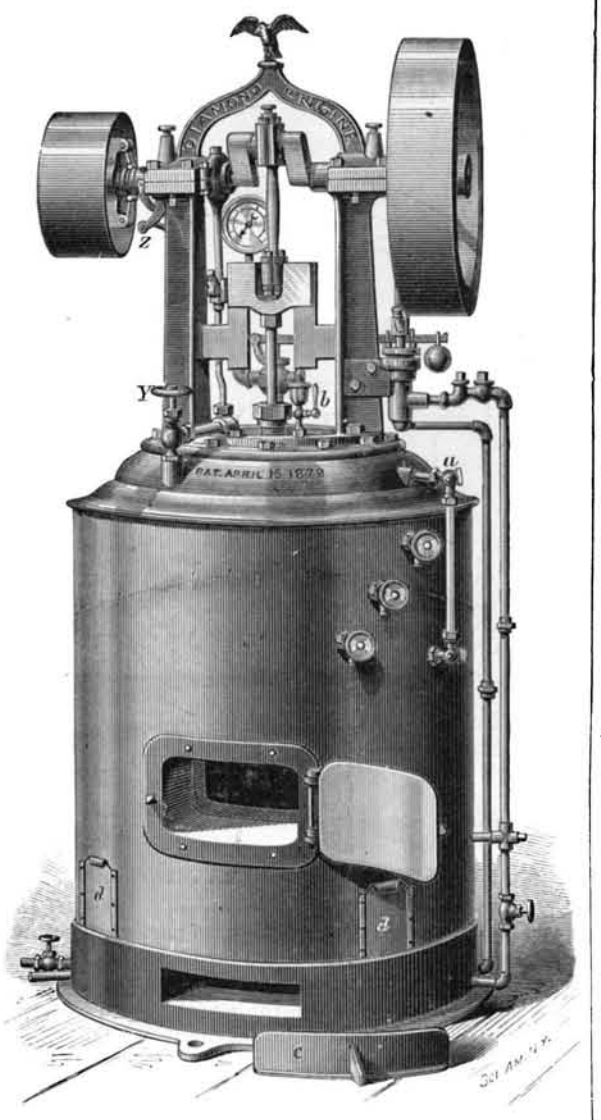
Mr. Rufus P. Bowdoin, of Brooklyn, N. Y., has patented an improved device for converting reciprocating into rotary motion. It is especially intended for use in connection with steam engines, and it consists in combining with a reciprocating slide a shaft fitted with diametrically opposite cranks, a pair of toggle joints, and links for connecting them with the cranks.

An improvement in doubling and winding machines has been patented by Mr. Thomas Unsworth, of Manchester, England. It consists in a novel combination of mechanical devices by which improved results are secured. The machine cannot be properly described without an engraving.

Mr. Joseph H. Townsend, of Brooklyn, N. Y., has patented an improved sheave for rolling doors in which a plate and a stop are combined with a case, roller, and eccentric pin.

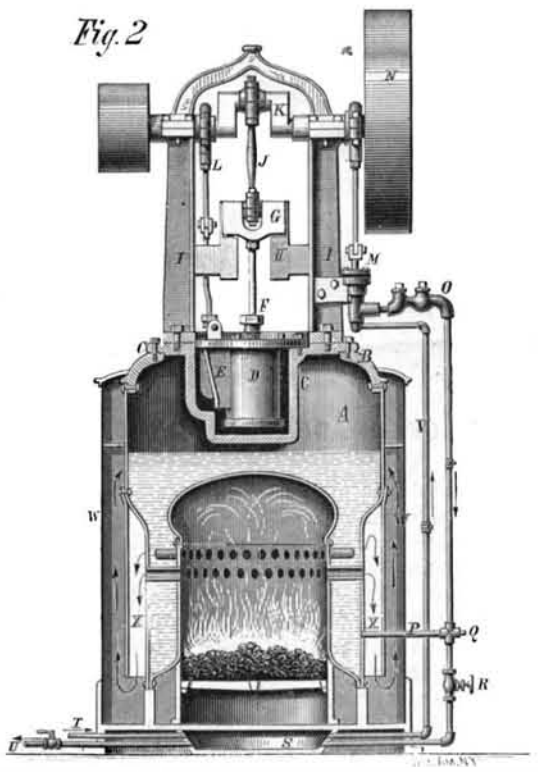
A NEW PORTABLE ENGINE.

The accompanying engravings represent an improved portable self contained steam engine, called the "Diamond."



FALES' PORTABLE ENGINE.

It is intended for a great variety of uses where a light, safe, and economical power is required. Externally this engine appears like others in market, but there are points in its construction that seem quite novel. The cylinder, D, and its valve chest, E, are suspended in air chamber, C, which projects downward into the steam room of the boiler, A, and really forms a portion of the upper head of the boiler. All of the parts of the engine are separate from the boiler, and may be removed from it while steam is up if necessary. The cylinder, D, has its upper head extended, forming a flange for its support. The crank shaft, K, and the moving parts connected therewith, are supported by the standards, I, which, together with the guides, H, and the ring that sets upon the flange of the air chamber, C, form a single casting. It will be seen that this construction insures rigidity, and at the same time admits of getting at the various parts for adjustment or repair.



VERTICAL SECTION OF ENGINE AND BOILER.

The boiler is contracted below the crown sheet and provided with a deflector, X, which carries the smoke issuing from the short horizontal flues downward to the base of the boiler, whence it passes upward to the smoke stack.

The fire is in direct contact with the water surface in the fire box, and all of the surfaces exposed to any considerable heat are entirely covered with water. Ample means are provided for cleaning the interior of the boiler, a point of great importance, especially in this class of engines.

The pump, M, draws water through the heater, S, which is placed directly under the grate, and the water pipes are connected with the boiler, so that the heater may be blown out and cleaned by water and steam from the boiler.

The manufacturers claim great advantages in the use of the hot air chamber in which the cylinder is placed. It is equivalent to a steam jacket, so far as its advantages are concerned, but it has not the disadvantages of always being moist and in a state of corrosion.

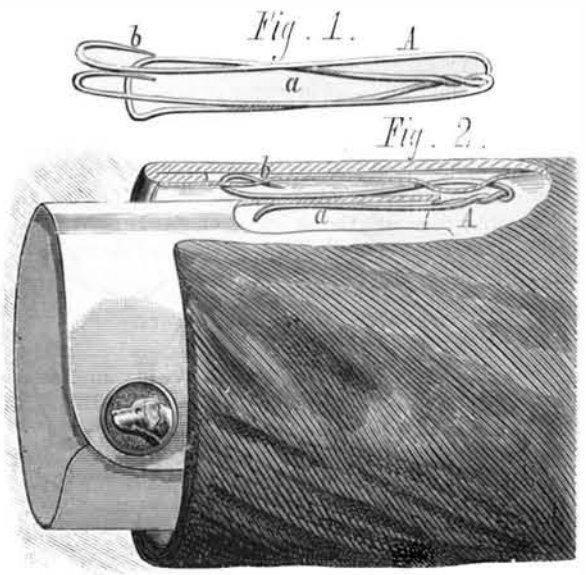
The governor attached to this engine is placed in the pulley and avoids the possible derangement of the governor valve by bending the stem, by drawing instead of pushing in the direction of the greatest strain.

The engine is provided with all of the usual appurtenances, such as the safety valve, gauge cocks, water gauge, steam gauge, etc., etc., and the manufacturers inform us that the workmanship and materials are first-class.

Further particulars may be obtained from Mr. Thomas J. Fales, general agent, 118 Liberty street, New York, P. O. box 3971.

NEW CUFF HOLDER.

The annexed engraving represents a simple and convenient device for attaching cuffs to the sleeves of garments, recently patented by Mr. Charles F. Doring, of Troy, N. Y. It consists of a piece of spring wire bent into a loop, *a*, twisted together and returned upon itself, and having hooks, *b*, formed



DORING'S CUFF HOLDER.

on the ends, as shown in Fig. 1. The holder is shown in position on a sleeve in Fig. 2. The loop, *a*, springs down upon the back of the hooks, *b*, forming a spring clamp that is capable of retaining the cuff securely in place, dispensing with buttons, and affording a ready means of adjusting the cuff. After the holder is once placed in the sleeve it may remain until the garment is worn out.

Further information may be obtained by addressing the inventor at No. 12 Harrison Place, Troy, N. Y.

The Convention of Civil Engineers.

The eleventh annual convention of the American Society of Civil Engineers was held in Cleveland, Ohio, June 17 to 21. The meeting was regarded as one of the most largely attended, enjoyable, and profitable ever held by the society. The officers were: Mr. Charles Paine, General Superintendent of the Lake Shore and Michigan Southern Railway, President; Mr. John Bogart, of New York, Secretary; and Major Geo. W. Dresser, editor of the *American Gaslight Journal*, Assistant Secretary. The Committee on Papers were: Mr. Octave Chanute, Chief Engineer of Erie Railway, New York; Col. W. E. Merrill, U. S. Engineer Corps, Cincinnati, Ohio; and Mr. John Kenedy, Chief Engineer of the Montreal Harbor Commission.

A large number of important papers were read and discussed, and a great deal of professional sight-seeing and practical study was undertaken. The daily programmes included visits to the Cleveland Viaduct, the reservoir and pumping works of the Cleveland water works, the Telegraph Supply Company's works, and many other important engineering and industrial establishments in and about Cleveland, besides more extended excursions to the Mahoning Valley coal fields and the Bradford oil district.

Among the resolutions adopted by the society was one in favor of holding, in addition to the annual convention, a number of general meetings in various cities in each year for professional intercourse.

The Quickest Atlantic Passage.

The new steamer Arizona, which passed Sandy Hook at half past five, June 17, arrived at Queenstown at twenty minutes past seven the morning of June 25. The actual running time was 7 days 9 hours and 23 minutes, the fastest transatlantic trip on record. This is 1½ hour less than the time of the Britannic, in August, 1877.

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The Smoke of an Electric Lamp.

At our meeting in December, 1878, Mr. J. W. Swan exhibited an electric lamp, on the incandescence principle, which had broken down in consequence of the electric force being too great for the cylinder of carbon through which it had to pass. One of the points of interest noted was the appearance of a sooty deposit on the inside of the glass. The flask which contained the carbon pencil and its platinum conductors, having been filled with nitrogen and exhausted with a Sprengel pump, was supposed to contain nothing which could act as a carrier to convey by chemical means any carbon from the incandescent pencil to the cooler surfaces in its neighborhood. The phenomenon appeared to be such as has been spoken of under the term "volatilization of carbon." Mr. Swan having placed the lamp at my disposal for examination, I have now the pleasure of bringing under your notice the results. Under the microscope the smoky deposit on the glass showed numerous bright globules, no doubt platinum, and more minute particles of dark matter nebulous under a quarter inch objective. A fragment of the glass being exposed to an oxidizing heat, the deposit partially disappeared, still leaving the glass slightly darkened.

The platinum support—which had also a coating of dark sublimate at a little distance above and below the carbon pencil, but not in immediate juxtaposition with it—was next examined by exposing to the blowpipe flame the unsmoked portion, so that the conducted heat might act upon the deposit without the fear of the blast carrying away the matter, which was very loosely attached. In this way the deposit was burnt off without the mechanical action of the blast, the heat to which it had been subjected being that of dull redness. A piece of the glass was then treated with *aqua regia* for several days. The deposit was diminished, but far from being entirely dissolved; the solution gave a blue reaction with yellow prussiate of potassa, and no coloration with tannin till aided by vapor of carbonate of ammonia, when the usual purple color of ferric tannate was developed. There is thus evidence of the deposit containing platinum, carbon, and iron. Probably the scattering of platinum globules might result from the disruptive discharge which took place at the moment of the lamp breaking down.—*B. S. Proctor, in the Newcastle Chemical Society's Journal.*

Asphalt and Timber Floors.

A curious method of laying down floors has been adopted in France, and is said to have obtained a wide application. It consists in putting down flooring, not, as hitherto, on joists, but in embedding the boarding in asphalt. The new floors are used mostly for ground stories of barracks and hospitals, as well as churches and courts of law. Pieces of oak, usually 2½ to 4 inches broad, 12 to 30 inches long, and 1 inch thick, are pressed down into a layer of hot asphalt, not quite half an inch thick, in the well known herring bone pattern. To insure a complete adhesion of the wood to the asphalt and obtain the smallest possible joints, the edges of the pieces of wood are planed down, beveling towards the bottom, so that their cross section becomes wedge like. Nails, of course, are not necessary, and a perfect level surface may be given to the flooring by planing after the laying down. The advantages of this flooring, which only requires an even bed on which to rest, are said to be the following:

1. Damp from below and its consequences, rot, are prevented.
2. Floors may be cleaned quickly and with the least amount of water, insuring rapid drying.
3. Vermin cannot accumulate in the joints.
4. Unhealthy exhalations from the soil cannot penetrate into living rooms. Asphalt being impermeable to damp, rooms become perfectly healthy even if they are not vaulted underneath. In buildings with several stories, as in hospitals, the vitiated air of the lower rooms cannot ascend, an object which it has hitherto not been possible to attain by any other means.
5. The layer of asphalt will also prevent the spreading of fire from one floor to another in case of conflagration.

The flooring here described has been laid in the numerous casements of the newly constructed forts round Metz, to the satisfaction of the authorities. The cost is about a shilling per square foot. This estimate, somewhat high, would be much lower in districts where oak and labor are cheaper, and the distance from the places of construction less, and especially where there is more competition among contractors than at Metz; and the cost for larger undertakings may be reduced to eight shillings per square meter.

A CURIOUS ancient Mexican library has been found in the ruins of a vast palace at Xayi, near Chiapas, in southern Mexico. The writings are inscribed on terra-cotta tablets, half an inch thick, and are supposed to be sacred records, but the language in which they are written is not accurately known.—*L. A. Commercial.*

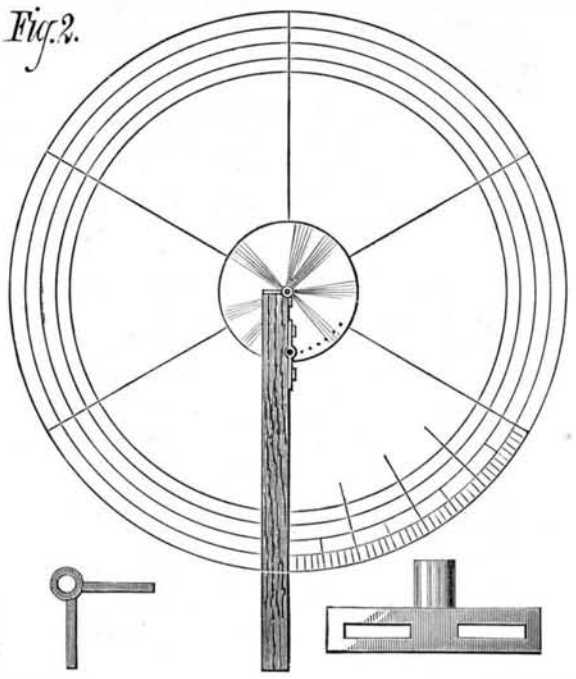
AMATEUR MECHANICS.

INDEX PLATES FOR GEAR CUTTING.

There are many amateurs who would make their own gear wheels were it not for the expense of purchasing or the trouble of dividing and drilling the index plate, which is the principal item in the apparatus required in cutting small gears.

Of course an index plate may be purchased, but the money

Fig. 2.



INDEX PLATES FOR GEAR CUTTING.

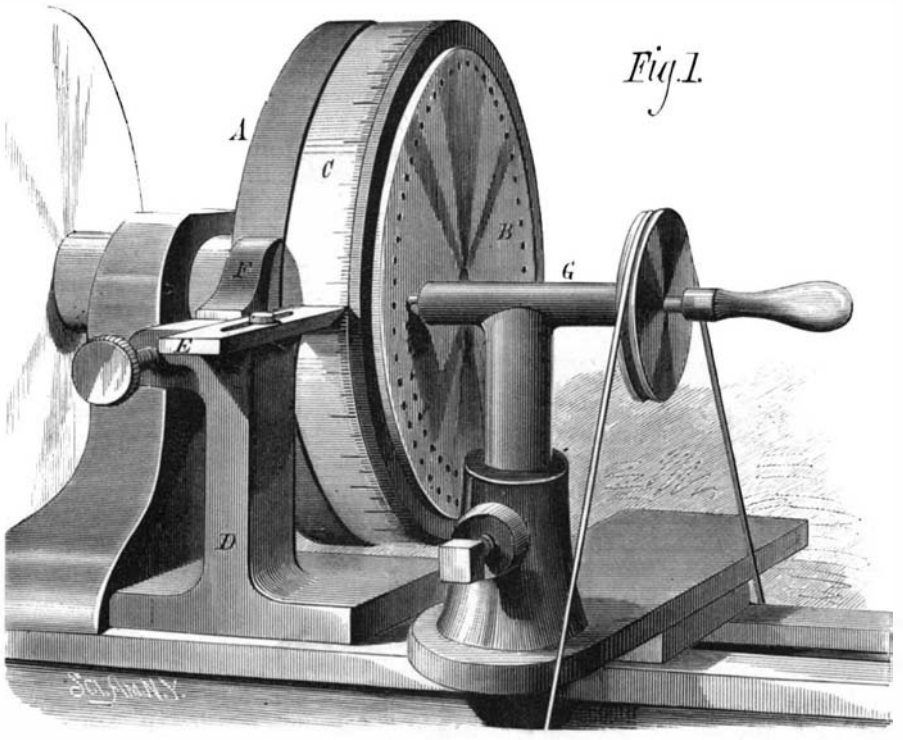
thus laid out would go a long way toward paying for cutting all the gears that would ever be required by most amateurs.

It is admitted that it is difficult to obtain absolute accuracy by ordinary methods, but the plans here suggested will probably give as nearly perfect results as can be obtained without copying another index plate or using a dividing engine.

The index plate, before being divided, should be nicely turned and fitted to the place it will occupy on the lathe. This will generally be on the larger side of the cone pulley.

Two methods of graduating an index plate are illustrated by the accompanying engravings. One consists in locating the holes by using paper scales which are printed from engine divided plates, and are therefore very nearly accurate.

Fig. 1.



METHOD OF GRADUATING INDEX PLATES.

The other consists in dividing the plate by aid of a large paper disk graduated by hand.

For the most of purposes four rows of holes will answer. The best number of holes for the different rows is as follows: 240, 200, 144, 132. 240 can be divided as follows: 120, 60, 48, 40, 30, 20, 15, 12, 6. With 200 divisions: 100, 50, 40, 25, 20, 10, and 5 may be made. 144 divides into 72, 48, 36, 24, 18, 16, 12, 9, 8, 6. 132 into 66, 44, 33, 22, 11.

The best method of dividing an index plate of which the writer has any knowledge, aside from duplicating another, or using a dividing engine, is shown in Fig. 1. A wooden block, A, is attached to the face plate of the lathe by means of screws and turned down truly on the face and upon the edge. A portion of the edge is turned to a suitable diameter for receiving a certain length of paper scale, C. The other portion of the edge is pressed by a brake shoe, F, which is kept up by a screw in the standard, D. An index, E, is slotted and secured to the top of the standard, D, by a screw. To the face of the block, A, is secured the index plate, B, and in front of the plate there is a drill support which takes the place of the ordinary tool rest. The drill is capable of longitudinal as well as rotary motion in its support; it is driven by a belt from the drive wheel of the lathe, and is pushed forward a limited distance by the handle swiveled to the end of the drill spindle. The size of the drill will be governed altogether by the size of the plate; but in any case it should be as large as possible, always bearing in mind that the space between the holes should be of sufficient width to insure the required strength.

That portion of the wooden block, A, which receives the paper scale, C, is carefully turned so as to permit the ends of the scale to abut; the scale being very carefully cut so that its ends will join accurately and render the graduations of the scale uniform throughout. The scale is best attached to the block by means of paper tacks or small screws. For the greatest number of graduations given above, a two foot paper scale, or two pieces of shorter scales, will be required. The inches should be divided into tenths. The block should be 7·64 inches in diameter where it is surrounded by the scale. The diameter of that part engaged by the brake shoe is not limited to any particular size.

It is obvious that for drilling 240 holes every mark on the scale must be brought opposite the index, E, and stopped by means of the brake, F, while a hole is drilled. After drilling this row of holes, the row containing 144 holes should be drilled, leaving a space between it and the 240 row for the 200 row. For the 144 row the operation is the same as that already described, except that a scale divided into twelfths is used, and alternate graduations only are noticed, the intermediate ones should be crossed out so that the scale will really be a scale of inches divided into sixths. For the 132 row the block is turned down to 7 inches diameter, and the scale last used is shortened to 22 inches and again applied to the block and used as before.

After completing these rows of holes the drill is moved to the space between the first and second rows, the block is turned down to 6·36 inches, and 20 inches of the paper scale first used (inches divided into tenths) is employed. Every graduation on the paper scale is used in this case as in the first instance. This gives 200 divisions.

The paper scales recommended for this purpose are those used by engineers and draughtsmen. They may be obtained for a few cents from any dealer in mathematical instruments.

In Fig. 2, the larger circle represents a disk of paper which is carefully divided into large spaces by means of ordinary dividers, and the large spaces are subdivided in the same way.

In the center of the paper disk is placed the plate to be divided, and from the center of the plate rises a stud, to which is accurately fitted the sleeve attached to the end of the radius bar. The radius bar extends beyond the outer circle on the paper disk, and carries an adjustable sleeve, to which is accurately fitted a drill which may be rotated by means of a small drill stock. The sleeve that forms the bearing of the radius bar is shown in detail in the lower left hand corner of the engraving, and the sleeve that receives the drill is shown in the opposite corner.

While drilling, the radius bar is held in place by a weight or by means of a clamp. After drilling each hole, the bar is moved forward one space and secured by the weight or clamp. When one row of holes is completed, the sleeve which guides the drill is moved toward the center of the disk, and the operation of drilling is carried on as before. By this method whatever errors may exist in the graduations on the paper disk are greatly reduced in the index plate, and the plate produced will be accurate enough for most purposes if the work on the paper disk has been carefully done. The smallest plate should be at least three sixteenths of an inch thick, and the holes should not be drilled quite through. Either iron or brass may be used for the disk. The latter works the easiest and will answer every purpose.

In a subsequent article a simple gear cutter will be described which may be readily applied to any foot lathe. M.

Instrument of Resuscitation.

A Frenchman has the credit of inventing an apparatus for aiding in the resuscitation of persons apparently drowned, or who from any other cause have been temporarily deprived of animation. It consists of a cylinder of sheet iron large enough to contain the body of an adult person. It is closed at one end, and the inanimate individual is inserted, feet foremost, in the receptacle as far as the neck, round which there is placed a padded diaphragm, fastened to the cylinder so as to be airtight. An air pump, attached to an opening in the tube, creates a partial vacuum, and then the outer atmosphere, by its own pressure, forces its way into the lungs by the mouth and nostrils, which are left exposed. By a reversed action of the pump the air is allowed to re-enter the

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cylinder, and respiration is thereby re-established. A glass plate inserted in the iron casing enables the operator to watch the movements of the chest, which rises and falls as in life with the working of the pump. The action may be repeated, it is stated, eighteen times in a minute, an exact imitation of natural breathing being thus produced.

NEW DRAG SAWING MACHINE.

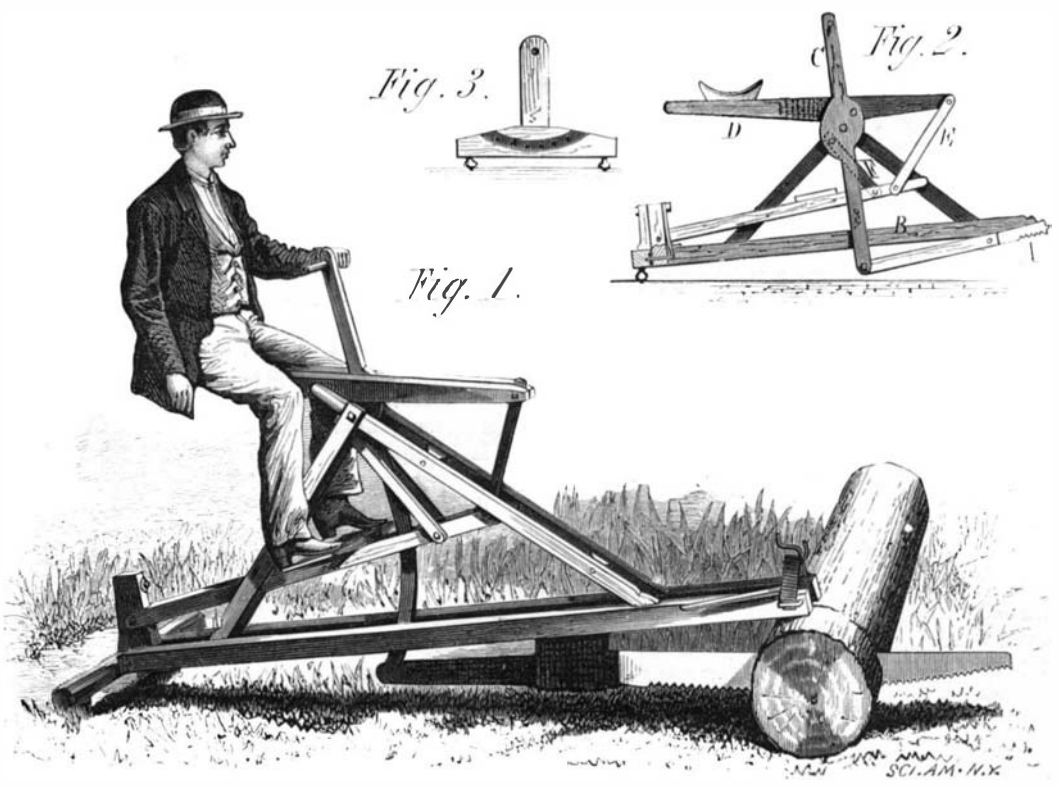
The engraving on this page represents, in Fig. 1, Messrs. Alters & Brasington's improved drag saw in actual operation, and in Figs. 2 and 3 the details of its construction are shown. The saw is capable of being easily operated by one man, as the weight of the operator, the pressure of his feet, and the power exerted by the hands are all utilized in giving a reciprocating motion to the saw.

The saw, A, runs between two parallel bars, B, which are connected with an upright pivoted to the standard, shown in detail in Fig. 3. This standard rises from a cross-piece which gives a broad base to the machine, and in which is set a perforated curved plate for receiving the latch or detent carried by the pivoted saw guide. By means of this device the saw may be adapted to inclined or uneven surfaces, as the saw frame may always be adjusted to a vertical position and secured by the detent or latch.

The saw head is pivoted at its rear end to the lower end of the lever, C, which reaches upward and is fulcrumed in the timbers rising from the bars, B, and is provided above the fulcrum with a T handle. In the lever, E, forward of its fulcrum, a rock lever, D, is pivoted. This lever is composed of two parallel bars united at the ends, and supports a saddle for the operator at one end, while the other end is connected by a link, E, with the treadle lever, which is fulcrumed at the rear of the machine just above the bars, B. The treadle lever is connected by a link, F, with the lever, C, at a point just back of its fulcrum. At the forward ends of the bars, B, there are a guide for starting the saw, and two spurs which enter the log and hold the machine in place.

The method of operating the machine will be clearly understood from Fig. 1. The operator sits upon the saddle, as indicated, and his weight being disposed forward of the fulcrum of the lever C, tends to throw the lever back, as does also the power exerted by the hands pushing forward on the handle, while the pressure of the feet of the operator on the treadle lever being expended on the lever, C, through the connecting bar back of the fulcrum, and the power exerted in drawing the lever back by the hands, throw the saw forward. Thus, by the weight of the operator, the pressure of the feet on the treadle lever, and the power exerted through the handle of lever, C, a reciprocating motion is communicated to the saw, by which it is rapidly and easily operated.

Further information may be obtained by addressing Messrs. Alters & Brasington, Maiden Rock, Wis.



ALTERS & BRASINGTON'S DRAG SAW.

Manganese Bronze.

This metal, of which further accounts will be found in back numbers of the SCIENTIFIC AMERICAN, also in our SUPPLEMENT, No. 51, is made by adding from one to two per cent of manganese to the proper proportions of copper and zinc as used in making brass or bronze.

In order to illustrate the progress made by this invention, Mr. P. M. Parsons lately sent to the South Kensington Museum a large collection of specimens for exhibition at the conversazione of the Institution of Civil Engineers. There was, says the *Mining Journal*, first, a splendid rolled plate, 9 feet long by 3 feet wide, No. 11 wire gauge, of beautiful color and perfect in texture and surface, together with angle bars and rivets of the same quality of metal rolled hot; also a smaller piece of two plates and an angle bar riveted together cold to illustrate the application of the manganese bronze to the building of torpedo boats, steam launches, yachts, etc., these plates, etc., being a part of some supplied to the Thames Ironworks Company for a torpedo boat built by them to the order of Messrs. Maudslay Sons & Field for the Admiralty. The manganese bronze was proposed by Messrs. Maudslay with a view to obviate the defect steel is liable to of rapidly oxidizing, and the contract for the bronze plates was taken under a stipulation that they should sustain the Admiralty test for steel plates, which they did perfectly, giving a tensile strength of over 29 tons per square inch and an elongation of 25 to 35 per cent, and bending without cracking to a much closer radius than stipulated by the Admiralty. Besides these specimens in rolled and forged metal there were a number of rolled rods of various sizes used for pump rods, and for making into bolts, etc.; several forged bolts and nuts, one of large size for holding on the blades of propellers; and, lastly, coils of wire, of various gauges from that used for making rivets down to the smallest size. In the way of castings there were a pair of connecting rod brasses belonging to the engines of one of a pair of vessels Messrs. R. Napier & Son, of Glasgow, are building for the Pacific Steam Navigation Company, in which engines nearly all the parts usually of gun metal are of manganese bronze, including the main bearings, crank pin, brasses, piston rings, etc. Besides this company, a large number of the principal steam navigation companies and engineers are using the manganese bronze for these purposes, it having been proved by careful experiments that it is at least 60 per cent stronger than gun metal, and wears three or four times as long. The next article is a casting of a cylinder and frame of a rockboring machine, shown to illustrate the applicability of the metal to make intricate castings; then, of the same metal, some castings for stop cocks, and a cycloidal propeller. The metal from which all these articles are cast has peculiarly valuable qualities. In the first place, in casting it runs very fluid, and the thinnest and most intricate castings can be made from it perfectly sound. It is wonderfully strong and tough when simply cast—a 1 inch square bar on supports 12 inches apart, required 4,256 lb. to break it, which is considerably above the strength of good wrought iron; a piece of plate not more than ⅛ inch thick, cast in green sand, with a beautiful surface, was shown doubled up nearly flat without cracking; this same quality can also be forged and rolled, and then its strength is quite equal to that of steel.

The average tensile strength of the metal when forged or rolled is 30 tons per square inch, with an elastic limit of from 11 to 18 tons, and an elongation of from 20 to 45 per cent, this is in its annealed state; when it is cold worked or rolled, the breaking strength in bars or rods rises to about 40 tons per square inch, with an elastic limit of over 30 tons, and an elongation of about 12 per cent. When drawn into wire the strength goes up still higher, the highest yet obtained being about 70 tons per square inch; but further experiments are still being conducted, with a view to get a yet higher result, as it is believed from the peculiar musical tone the metal emits that it will be admirably adapted for the wires of musical instruments, as it will have the additional advantage of not rusting.

It will also be applicable to a variety of other purposes, for which ordinary brass is now used, such, for instance, as wood screws, hinges, the plates and other parts of locks, and brass fittings generally, for all these purposes a quality can be supplied at least twice as strong as ordinary brass, and not more costly. In order to test the strength of the metal for wood screws some were simply cast in sand of the manganese bronze, using an ordinary iron screw as the pattern, and these cast screws were tested against the iron screws they were made from by screwing each into solid blocks of wood up to the head without first boring any hole in the wood except for ¼ inch to enter the point of the screw; the result was both the iron and the bronze screw went into a piece of deal up to the head; they then did the same into a piece of hard Spanish mahogany; and, lastly, they were tried in solid boxwood; they both entered into this about ¼ inch beyond the screwed part, and then twisted off.

This test, therefore, showed that manganese bronze screws simply cast were about as strong as wrought iron, and when they come to be made of drawn wire, they will fully equal steel, and this superior strength will, no doubt, be of equal advantage for all the articles above enumerated.

CARBONIC ACID IN THE ATMOSPHERE.—The air contains in 10,000 parts 2·942 parts of carbonic acid by volume. The most extreme variations have not exceeded 3 parts in 10,000. —*J. Reiset in Comptes Rendus.*

Improved Process for the Manufacture of Gypsum Casts.

BY DR. VON DECHEUDIN, BONN.

The improvement consists in hardening the surface of the cast by means of some insoluble precipitates, which fill the pores, prevent dust from entering, and are not affected by water.

A few coats of a hot and saturated solution of borax, alum, or similar substances are applied with a brush until the surface has the desired hardness. Two coats will generally answer, but occasionally as many as five or six may be necessary.

A few (generally two) coats of a hot saturated solution of chloride of barium and a few coats of soap water are then applied with a brush, and the surplus soap is washed off until the clear water forms beads on the surface of the cast.

These operations can be performed in a few hours and produce a hard surface consisting of substances insoluble in water and which will prevent the appearance of yellow spots, for the neutral salts that have been employed will prevent any action of the gypsum on the iron contained in the same. Different neutral salts may be used, and the operations may be performed in the reverse order. Instead of chloride of barium, other barium, strontium, or calcium salts, that will produce an insoluble precipitate and will not produce oxide of iron, may be used.

Employment.

The following just sentiment was uttered by Daniel Webster, in a speech in the Senate of the United States. It should be had in everlasting remembrance:

"Sir, I say it is employment that makes the people happy. Sir, this great truth ought never to be forgotten; it ought to be placed upon the title page of every book on political economy intended for America, and such countries as America. It ought to be placed in every farmer's magazine and mechanic's magazine. It should be proclaimed everywhere, notwithstanding what we hear of the usefulness—and I admit the high usefulness of cheap food—notwithstanding that the great truth should be proclaimed everywhere, should be made into a proverb, if it could—that where there is work for the hands and the men, there will be work for their teeth. Where there is employment there will be bread. And in a country like our own, above all others, will this truth hold good—a country like ours, where, with a great deal of spirit and activity among the masses, if they can find employment, there is always great willingness for labor. If they can obtain fair compensation for their labor, they will have good houses—good clothing—good food, and the means of educating their families; and if they have good houses, and good clothing, and good food, and means of educating their children from their labor, that labor will be cheerful, and they will be a contented and happy people."

Tide Water Pipe Company (Limited) Opened.

At four o'clock in the afternoon of May 28, the monster pump of the Tide Water Pipe Company (Limited) was set in motion at Corryville, and the first oil entered the pipe and started toward Williamsport, reaching the latter place about 7:10 P.M. on June 4, one hundred and forty-seven hours and ten minutes after leaving Corryville.

The quantity required to fill the pipe was 20,000 barrels. This is the first 6 inch pipe line of any considerable length ever constructed. The line is 100 miles long. There are but two pumping stations, one at Corryville, and the other 22½ miles from this place. The highest elevation, 1,200 feet is reached about 31 miles east of Corryville, and from this point the oil reaches Williamsport by gravity.

The estimated cost of the line is between $700,000 and $800,000. The weight of pipe used is 5,000 tons. The minimum capacity of the line is 6,000 barrels daily, which can be increased under pressure to 10,000 barrels.—*Stowell's Reporter.*

New Alloy.

M. Phillips has made some experiments for the determination of the coefficient of elasticity and of the limit of elasticity of different bodies. He refers especially to a new alloy which was melted and cast by Matthey, of London. Its density at the freezing point is 21·6139. Its composition is: Platinum, 80·660; iridium, 19·079; rhodium, ·122; iron, ·098; ruthenium, ·046. This alloy is so malleable and ductile that M. Sainte-Claire Deville possesses a thread of it, which is only a few hundredths of a millimeter in diameter, and is scarcely visible. A hundredth of a millimeter is only $\frac{1}{2500}$ inch.

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MISCELLANEOUS INVENTIONS.

Mr. George W. Da Cunha, of 207 West 38th St., New York city, has devised a new form of drawing board, in which the frame is kept squarely in contact with the board. The shrinkage of the board is compensated for and an adjustable squaring edge is provided. The devicealso prevents the paper from wrinkling.

Messrs. Geo. A. Welden and Wm. K. Royce, of Austin, Mo., have invented an improved buckle for connecting harness traces with the shoulder straps. It is provided with a peculiar latching device, which renders it secure.

An improved attachment for hats, which holds them securely upon the head, and provides an air space on all sides, has been patented by Messrs. V. B. Waddell and James F. Sample, of Austin, Miss. It consists in a circular frame having angular adjustable rests attached to the hat.

A compound for incense coal has been patented by Mr. E. W. J. Lindesmith, of Leetonia, O. It consists of charcoal, an adhesive material, saltpeter, and a suitable perfume, mixed together with water, and dried.

Mr. Richard T. Ogden, of Philadelphia, Pa., has patented an improved coasting sled, adapted to carry a number of persons, and provided with several foot rests at each side. The forward runners are swiveled, and the seat board is provided with a fender and guide rolls.

Mr. Pierre Auguste De La Nux, of Honolulu, Sandwich Islands, has patented an improved saddle stirrup. The improvement consists in an elastic foot holder formed of vulcanized rubber, having a spiral spring core, and in the novel arrangement of an arbor and spur wheel.

Mr. Samuel P. Halleck, of Oriskany, N. Y., has patented an improved device for teaching arithmetic. It is adapted for use in schools and families, and is designed for teaching addition, subtraction, multiplication, and division. It consists in combining with rollers a notated rolling curtain, a curtain for cutting off a portion of the figures on the notated curtain, and weighted tapes for adjusting the curtains.

An improvement in washboards, consisting in pivoting between the rails, rolls, or bars, which may be locked so as to prevent them from turning, or may have pressure applied to them, so that they will add to the resistance in rubbing the clothes, has been patented by Mr. Ferris Freligh, of Rodney, Miss.

Mr. George W. Dean, of New York city, has patented an improved wash basin, provided with a novel valve, which permits the water to escape, but prevents the entrance of sewer gas. It consists of a tube placed in the overflow, and provided with a hinged valve seated upon the oblique end of the tube.

An improved thill coupling, patented by Mr. Richard W. Hawes, of Hohokus, N. J., consists in a cross pin provided with an annular groove near each end, and two elastic washers adapted to the grooves, which are sprung into the grooves after the pin is in place.

Mr. Carl J. Kramer, of Shiloh, La., has patented an improved combined sad iron and fluting roller. The sad iron is made hollow, open at the top and rear, and provided with a door at the rear, and arranged to receive the fluting rollers, which are heated by the iron block or coals that heat the sad iron

An improvement in attaching electrical switch wires to binding posts, patented by Mr. James E. Hamilton, of New York city, consists of a screw plug, which enters the coil of the wire and makes a metallic connection, and at the same time connects the wire and its fibrous covering with the plug, which is adapted to the ordinary binding posts.

An improved fence post, having twisted wires held to the middle thereof by nails, and extended beyond each side of post in the form of bows to receive the boards which form the fence panels, has been patented by Mr. Jacob Frazer, of Centralia, Ill.

Mr. G. H. Weed, of South Norwalk, Conn., has patented an improved thill coupling, the novel features of which consist in an eccentric pawl pivoted between arms projecting from the clip attached to the axle, and in a yoke extending over the arms for confining the end of the thill iron provided with a lug, which is engaged by the eccentric pawl.

An improved corset, patented by Mr. George H. Clarke, Portland, Oregon, is designed especially for women nursing children, and is constructed with special reference to this particular use.

An improved packing box for eggs has been patented by Mr. Ignatz Karel, of Blue Earth City, Minn. It consists of a box packed with alternate plates and cylinders of pasteboard or sheet metal, and having on the cover and bottom corrugated springs, forming a yielding support for the contents of the box.

A butter and egg package, consisting of an air-tight and waterproof box, with drawers and intervailed strips, having longitudinal recesses in the edge, has been patented by Mr. Samuel McHenry, of Sparta, Ill.

An improved neck yoke coupling for vehicles has been patented by Mr. Samuel Brown, of Burnip's Corners, Mich. It is designed to prevent the tongue from dropping should a lug or the whiffletree become loose. It consists of two springs of peculiar form attached to the end of the tongue.

MACHINERY FOR MAKING SHINGLES.

To meet the popular demand for a very low priced, yet efficient machine for sawing shingles, short heading, pail bottoms, box boards, and other thin stuff, Messrs. Trevor & Co., of Lockport, N. Y., have designed the machine of the horizontal class shown in Fig. 1. It has a well designed iron frame, and will take a saw up to 38 inches in diameter. It is said to be fitted up in every respect equal to larger machines.

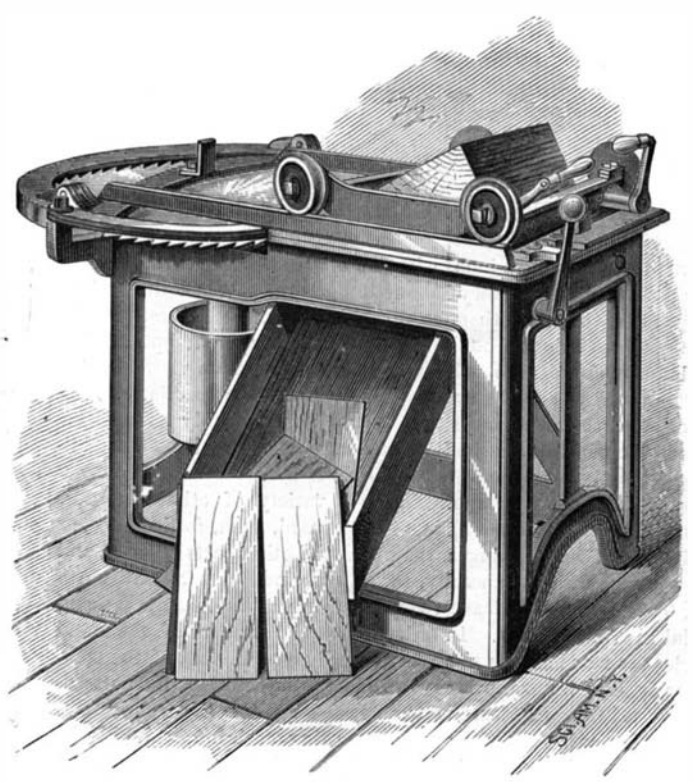

Fig. 1.—THE VICTOR SHINGLE-SAWING MACHINE.

The patterns have been designed with the special view of reducing the cost of production, so that it may be sold at a low price. The machine has a balance wheel of good weight, and a very convenient arrangement for shifting the gauge for points and butts of shingles. The saw is well guarded, and it is easily and quickly removed from and replaced in the machine. It takes but very little room, requires little power, and is adapted to the wants of a large class who possess small mills and do a moderate business. It is compact and can be conveniently transported at a distance from railroads, and is well adapted to temporary mills. It is capable of doing a large amount of work, its running parts being very strong for the size of machine. Saws of light gauge can be used, and a saving of timber effected over larger machines.

Fig. 2 represents an improved machine for cutting shingles from steamed bolts. The machine has a substantial iron frame, and is arranged with an automatic feeding apparatus and with different racks, by which the thickness of the shingles can be varied, a few minutes only being required for effecting the change, by substitution of one pair of racks for another. It is claimed that this style of machine is superior to the machines with inclined sash or gate; Messrs. Trevor & Co. have patterns for and can build to order the machines with inclined sash. Both machines are operated by means of a pitman connecting the sash to the crank pin in a balance wheel on a counter shaft overhead. There is also a bevel gear on the counter shaft, which operates the feed works through a gear on the upper end of an upright rod, welded to the short upright rod shown in the cut, at the end of the table, at the back of the machine. This machine will cut about 40,000 shingles per day.

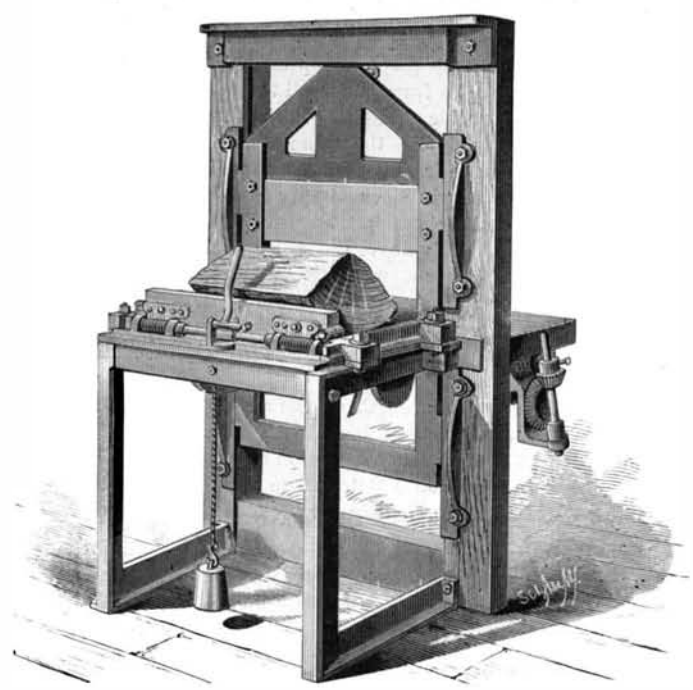

Fig. 2.—TREVOR & CO.'S SHINGLE-CUTTING MACHINE.

JONES' NEW PRESS MACHINE AND PROCESS.

A new pressing machine and sheet tier, invented and patented in this and several foreign countries, by Mr. J. W. Jones, of Harrisburg, Pa., mark a considerable advance in the economical treatment of paper after printing. The tedious handling of the sheets in placing them one by one between fuller or glazed boards before subjecting them to pressure for the removal of the indentations made by the type, is entirely dispensed with, to the great saving of time and space. The printed sheets are folded as they come from the printing press, and are directly subjected to hydraulic pressure in a compact yet powerful machine, and the pressure is retained by simply tying the bundles with cords. In this way a bundle of 500 sheets is pressed and tied up in three to five minutes. In other words the machine and process will dry-press from 6,000 to 7,500 sheets an hour, according to the capacity of the operator. The pressure is applied with two powerful hydraulic pumps, driven by hand or power. The pumps are provided with a safety valve, the beam of which is connected with an electric battery and gong, so adjusted that it can be set for any pressure required. When that is obtained, the gong instantly sounds an alarm. The motion of the plunger or ram is very quick, traveling its entire length in thirty seconds; for practical use it is required to travel only about two thirds its length, or twenty seconds.

The time required for the bundles to stand under the retained pressure is from twelve to twenty-four hours (which time can be considerably reduced by increasing pressure and using stronger cords), when the sheets are completely dry-pressed, all the indentations being removed without set-off. The machine will dry press cut work equally as well as letter press.

Several of these machines are in use in the government printing office at Washington, and are operating satisfactorily. There is obviously a further advantage in the saving of sheets soiled in the ordinary way of pressing and bundling; and the folded sheets are left in better condition for all the subsequent processes of binding. The machines are also suitable for pressing folded writing paper.

Increasing Healthfulness of London.

Recent sanitary improvements in London have had the effect of reducing the death rate so that the average saving of life during the past five years has been upward of 12,000, or nearly 61,000 in all, judged by the death rate of all England. In his annual report for 1878 the Registrar-General says:

"London is the greatest city in the world. Its population exceeds 3,500,000, or, if we add the population of its suburbs in the Outer Ring, the total population is 4,500,000. Its population approaches the aggregate population of 22 other large towns of the United Kingdom. It nearly equals the aggregate population of Paris, Berlin, and Vienna; or, with the suburbs, it equals the populations of the capitals of France, Prussia, Austria, and Russia. The area of this great city is 122 square miles, or a square of a little more than 11 miles to the side; so the density of population is 29,322 people to the square mile, and the proximity of the population is 11·04 yards, or the people are at a mean distance of 11·04 yards from each other. The low rate of mortality in London, if we take its density into consideration, is still more striking than its magnitude. With a density of 29,322 persons to the square mile, the mortality should be 35·2 per 1,000, were not special systems of drainage and cleanliness in use in London, by which the mortality in the years 1874–8 is reduced to 22·8. The consequence is that the deaths are so low in London as 83,695, and the births being 129,184, the registered births exceed the deaths by 45,489, which exceeds the estimated increase of population (43,693) by 1,796. In the seventeenth century the deaths in London equaled the births in number."

Typical Americans.

The court reporter of the Hartford *Courant* was so struck by the proportions of the members of the Grand Jury in attendance on the United States District Court, now in session there, that he had them weighed and measured. Of the nineteen members present only four were less than 6 feet high. Their average height was 6 feet 1⅛ inches, and the average weight 195 pounds. The tallest member was R. B. Craufurd, of Norwalk, 6 feet 4 inches, and the shortest E. L. Chapman, of Tolland, 5 feet 8½ inches.

A Quick Passage from Havana.

The steamship City of Washington, of Alexandre's line, which arrived from Havana, June 25, made the passage in three days and five hours. This is two hours and 45 minutes quicker than any passage she has heretofore made, and is the fastest passage on record between Havana and New York.

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Poison Mushrooms.

Mr. J. A. Palmer has a paper on poisoning by mushrooms in the *Moniteur Scientifique*. He states that there are three different ways in which mushrooms may act as a poison. First, they may produce the effects of indigestible matter, as when the hard coriaceous species is eaten; and even the edible mushroom may cause a similar result, for when it is decomposing it gives off sulphureted hydrogen gas in quantity sufficient to induce vomiting. Second, mushrooms may be gelatinous or acrid. Third, a subtle alkaloid, without smell or taste, is contained in some mushrooms, as, for instance, in the group of the amanitæ, and is called amanitin. No antidote has yet been discovered for this poison, and to it most of the cases of death following the eating of mushrooms is due. It is at first slow in its action, but after the lapse of eight to fifteen hours, the patient experiences stupefaction, nausea, and diarrhea. Delirium follows, and then death. Mushrooms containing amanitin will impart poisonous properties to wholesome varieties, if both happen to be placed in the same vessel. The poison can be absorbed by the pores of the skin. Mr. Palmer carried in his hand some amanitæ wrapped up in paper, and, notwithstanding the protection which the wrapper should have afforded, he was seized with alarming symptoms.

THE MARA.

The mara, or Patagonian cavy, as it is sometimes called, is a pretty little animal, which is remarkably swift for short distances, but it is so easily fatigued that it can be run down by a man on horseback. It is more tamable than the agouti, which it somewhat resembles, and is often kept in a state of domestication, being permitted to range the house and premises at will. It is generally found in couples, a male and his mate, occupying the same "form." It does not seem to burrow, nor to keep very close to its retreat. It is fond of crouching in a form like our common hare. It is about thirty inches in length, and about nineteen inches high at the crupper, which is the most elevated part of the animal. At the shoulders it hardly exceeds sixteen inches.

The fur of this animal is soft and warm, and from the contrasting colors of black, white, and golden brown, presents a very handsome appearance.

This beautiful little animal is not found further north than 37°. The dry and stony deserts of Patagonia are its home.

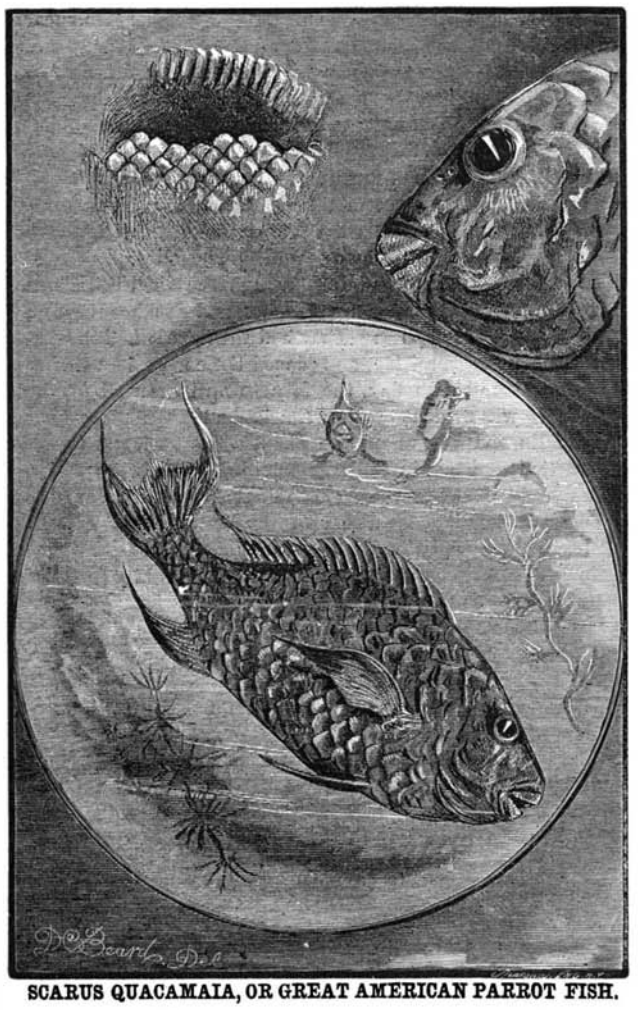
The Spectrum of Sodium.

Mr. J. N. Lockyer, F.R.S., says: I have lately been engaged in studying the spectrum of sodium under new experimental conditions. In anticipation of a detailed communication I take leave to state that the vapor given off from the metal, after slow distillation in a vacuum for some time, shows the red and green lines without any trace whatever of the yellow one. Hydrogen is given off in large quantities, and at times the C line and the red "structure" are seen alone. After this treatment the metal, even when red hot, volatilizes with great difficulty.

SCARUS QUACAMAIA, OR GREAT AMERICAN PARROT FISH.

BY DANIEL C. BEARD.

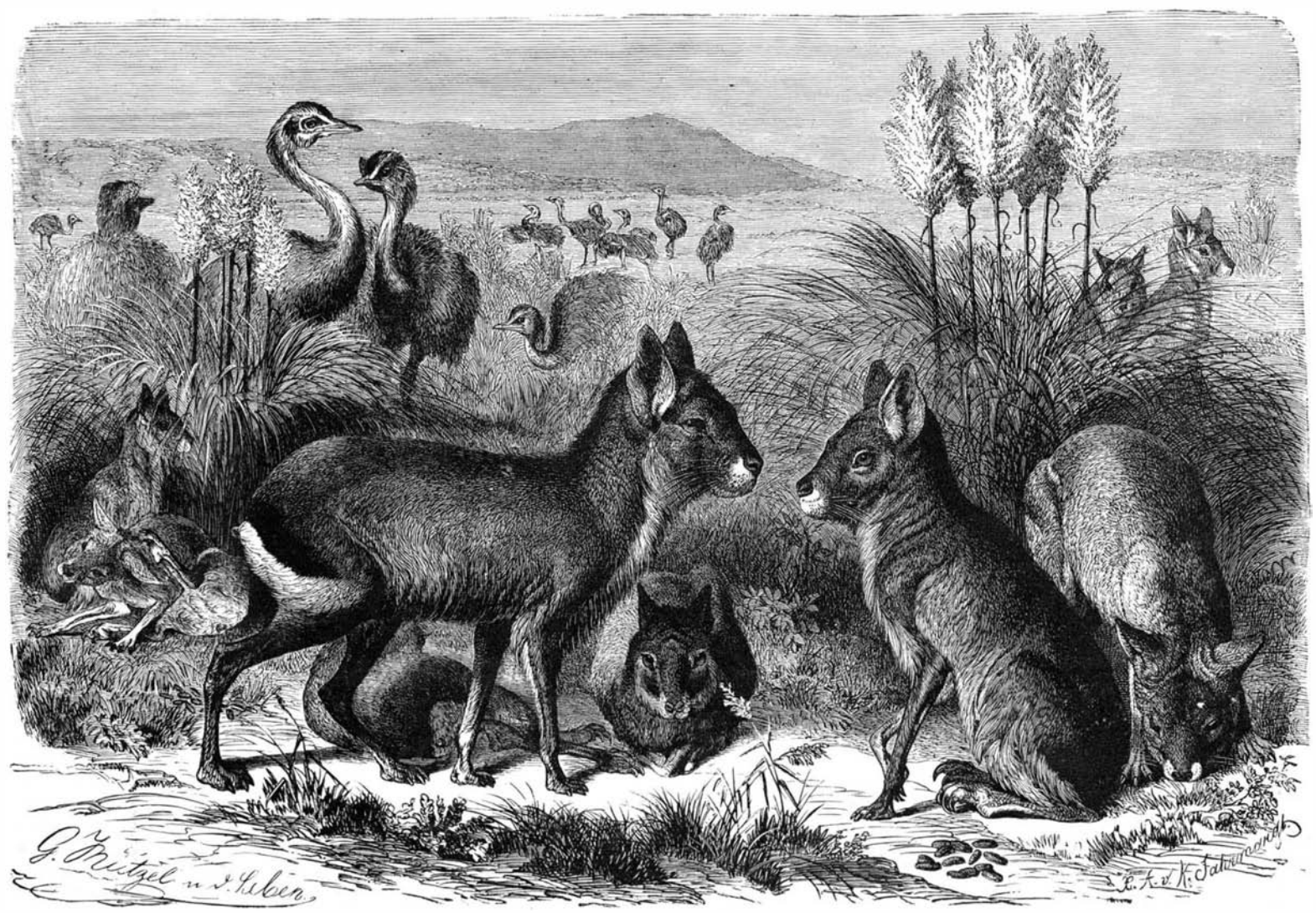
There is probably no more curious and beautiful fish in American waters than the great parrot fish; yet, after having spent nearly a day in a diligent search at the library, the writer was unable to find any account of the *S. quacamaia* beyond the bare mention of the fact that such a fish existed, but there are many careful drawings and accounts of the European *scarus*, a smaller and less elegant creature inhabiting the Mediterranean Sea.



SCARUS QUACAMAIA, OR GREAT AMERICAN PARROT FISH.

The specimen from which the annexed illustration was made came from Campeachy Bay, Mexico, and is now in the possession of Mr. Blackford, of Fulton Market; it measures, from tip of its beak to tip of its tail, three feet one inch, and its greatest vertical width is thirteen inches. In form it is not unlike the common "sheephead;" its dorsal and caudal fins terminate in long points, and the other fins have the same tendency. There are nine spiny and ten articulate dorsal rays; two spiny and eight articulate anal rays. There was no way of ascertaining its weight, but when alive it could have weighed not less than forty or fifty pounds. The most striking peculiarity of this fish is its dental anatomy. Its odd looking mouth or beak is composed of a bony structure of a bluish-green color, excepting the teeth upon the cutting edge, which are white and polished. These teeth, from the inside, have the appearance of being rather long single shafts set edge to edge (see illustration). Upon the outside, however, their compound structure is at once detected; the cutting edge of each jaw is composed of about fourteen irregular scallops or undulations, each of which is composed of about eight well defined teeth, with five or six very indistinct ones as a base. The four teeth which form the rim are white; the four crowded below are tinted with green, making a pretty green and white mosaic work; the green gradually grows darker until it merges into the uniform color of the bony beak or jaw.

The teeth of fishes offer a more striking series of varieties than that of any other class of animals. First, the sturgeon and the whole order of *Lophobranchii* are without teeth; the myxinoids have only a single tooth; and, lastly, are those fish whose mouths are filled with countless numbers of fangs or points, as the pike. The dental organs are always an important and almost a sure key to the habits of an animal; for from the form, construction, and position of the teeth an accurate and definite conclusion can be reached as to the kind of food eaten. So in the curious arrangement of the mouth of the parrot fish we see that the teeth grow in crowds, new ones being always ready to take the place of the old ones that are worn away, from which fact it would be natural to infer that the teeth are much worn in masticating the food, and that the food must be hard. This inference is proved to be correct upon learning that their food is the lithophytes that cover the bottom of the sea like a brilliant garden of many colored flowers. The sensitive little creatures upon which these fish feed, retire, when touched, into their calcareous suits of armor, and the fish must therefore be provided with suitable instruments for either crushing or digging out their prey from their stony coverings. Although we may laugh in derision at the ignorance and superstition of the ancients when they attribute to the scarus a voice, the habit of sleeping at night and ruminating by day, we must acknowledge that there was some logic in their method of reasoning, for the parrot fish certainly browses upon the corals much after the manner of ruminating animals. Until a comparatively recent date the corals were believed to be vegetables, and the little creatures themselves the flowers. Imagine this beautifully decorated fish with its brilliant hues, sailing through the transparent sea, browsing upon the richly colored corals, among gorgeous anemones and shell fish, and you have a submarine pastoral sketch on which even a Turner might exhaust his palette in colors.



THE MARA.—(*Dolichotis Patachonicus.*)

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The Giant Birds of New Zealand.

The Museum of Natural History in Central Park has now within its cases a very perfect series of specimens of some of the most wonderful creatures of prehistoric life yet discovered by science. These are the moas, or monster birds of New Zealand. They occupy a case in the extreme end of the Geological Hall, and owing to their massive proportions, look more like the monstrous remains of different quadrupeds than the sum total of one biped. Even the smallest bones equal or exceed in size the bones of the largest horse. In a recent letter, Mr. C. N. B. Munston says that "a leg bone of a moa, with a large piece of flesh adhering to it, was found some time ago in a cave in the province of Otago, and is now in the Otago Museum, Dunedin, N. Z." This seems to settle the vexed question as to whether the birds are actually extinct or not; but the truth of the statement is strongly contested—Dr. Haast, of the Canterbury Museum, declaring with one party, namely, that the creature has been extinct for hundreds of years, and Dr. Hector, director of the Colonial Museum, that a few moas may yet exist on the grassy slopes of the southern Alps, between the limit of the bush and snow line.

The thought of birds so huge swarming in the low lands suggests the tales of the Arabian Nights, and the "roc" seems almost a possibility. The moas, however, were wingless, and, notwithstanding their enormous strength, were evidently destroyed by man, if we may believe the story of the excavations made by Dr. Haast, which resulted in the fine collection now in the museum.

The place where the birds were first found was almost inaccessible, and when the cavity now called the Moa Bone Point Cave was enlarged by the waves of the sea the estuary of Heathcote-Avon in its present condition did not exist. Close to this cavity on its western side was a hard, doleritic lava stream, through which the summer road now passes to the sea. Masses of rock were detached by the surf, forming a ridge which gradually loses itself in the sand.

The formation of this ridge principally took place when this part of the peninsula was twelve or fifteen feet lower than at present, the upper line of bowlders being about sixteen feet above the present high water mark. When the land rose again the sea was cut off by this bowlder ridge from the entrance of the cave, across which lay a huge rock, protecting it and preventing it from being filled up by the deposits of drift sands now forming on the plat close to it. A second and lower line of bowlders was formed in front of the former, about five feet above the present high water mark, with a small terraced space behind it. Since then other deposits forming in the Heathcote-Avon estuary have created a small belt in front of this last line of bowlders, brought into its present condition by the action of the open sea. So it will be seen that nature has done its best to protect this treasure. Notwithstanding the constant changes of land and sea, the cave retained its individuality, the huge rocks and ledges thrown across its mouth by the fierce waves completely guarded its entrance, and repelled the invasion of the elements.

The entrance of the cave in which were found the remains is about forty feet from the summer road, which has an altitude of 1,859 feet above high water mark, and is nearly 5 feet lower, or 1,854 feet above high water, taking the level of the surface as a guide. An opening, which is about 30 feet broad by 8 feet high, much narrowed, however, by a huge rock, leads into the cave, of which the floor slopes gently down. The cave consists of three compartments, of which the first one is by far the largest. It runs nearly due north and south, is 102 feet long by 72 feet wide toward the middle, and about 24 feet high. From this cave's termination through a small passage, a second cave is reached, which is 18 feet long and 14 feet wide, and about 11 feet high, its direction being north by west to south by east. At its southern end a small passage, 3 feet high by about 2 feet 6 inches broad, leads into a third or inner chamber, which is more than 22 feet long, with an average width of 16 feet, and about 20 feet high, running like the principal cave, due north and south. Its floor is about 8 feet above high water mark.

Near the surface, and trodden in, lay many objects which showed that the cave had been inhabited as a dwelling place at some remote time. This entire stratum was removed by a systematic digging of trenches by the natives under the direction of Mr. Haast, and among the objects recovered were (1) cockle, periwinkle, and muscle shells common in the neighboring estuary; (2) a layer of ashes with pieces of flax, cabbage tree leaves, charred wood, etc; (3) ashes and dirt beds composed of the dropping of goats and cattle, introduced into Canterbury by the Europeans in 1839, and a few pieces of moa bones; (4) a layer of agglomeratic beds consisting of rocks that had evidently fallen from the roof. Between the layers of shells were found pieces of wood, partly charred pieces of wooden implements of Maori manufacture, plaitings made of *Phormium lenax*, and pieces of two broken polished stone implements, while close to the bottom of the trench moa bones were found representing several species. Mr. Haast, in noticing this, says: "I could not divest myself of the conviction that in and below the agglomeratic beds remains proving human occupancy would be found."

In a few days the men turned over a deposit covering an area about 20 by 30 feet wide, and advancing in a southwesterly direction, found the remains of a monster bird. The massive limbs, larger than those of the heaviest ox, had evidently been broken to extract the marrow. Evidences of industry were not wanting, as pieces of timber polished and planed down by stone implements, and upon one a red coating was still visible. Among the other objects of wood exhumed were several pieces of "toa," a thin and long wooden spear made of "tarra," a tree that only grows in the northern part of the Northern Islands. This spear is used by the Maori natives for shooting birds. For this purpose they form, as it were, a short tube around it with one hand, through which, after taking aim, they propel the thin spear suddenly with the other. The greatest part of a whaka-kai, a wooden disk made of pukatta, used for placing fat birds in so as not to lose the oil, or for the preparation of the juice of the topahulie, and many more implements of household use, were also found.

In this search human remains were not found, and it was not until two or three strata had been removed that they were discovered; but at last a Maori skeleton was found a few feet from the southwest wall. The aborigines who placed the body there had dug through the shell bed about 8 inches, then through the dirt 2 inches, and 4 inches through the agglomeratic deposit. They had then excavated the marine sands for several feet and placed the corpse in a sitting position, bound with flax, the face toward the wall of the rock. It was evident that the burial had taken place long before Europeans came to the place. The skeleton, which was articulated by Mr. Fuller, stands in the Canterbury Museum, and belongs to a man past middle age, and more than six feet in height. The ulna of the left arm was broken, and was only partly healed when he died; and letting imagination run rife, we can suppose that he was killed by the blow of a moa's "hoof"—an unbirdlike term, but appropriate to the facts of the case.

Judging by the molars of this unfortunate Maori, moa on toast was by no means a tender dish, as the teeth were worn and twisted into almost Quilpian ugliness. Most of the premolars were missing in the lower jaw, the alveoli (tooth socket) being quite absorbed. In the upper jaw, the first molar on the right side and the first on the left are twisted upward, their anterior surfaces adhered to the alveoli, which were developed in a slight bony outgrowth. Owing to a very remarkable distortion of the left molar, mastication was performed with its outer surface, which was worn. The condition of this specimen, its evident age, and that of the surrounding objects, points to the truth of the theory of Mr. Haast, that the dinornis became extinct at an extremely remote period.

The birds were found in many positions. Some in swamps where they had herded together in their flight, and like the mastodon, had been swallowed by the soft ooze that was to perpetuate their name in future ages. The natives now living attribute the first Maori to the Wattaha, the first immigrants who preceded the natives called Ngalimamoe, who preceded Ngotekwu, the present inhabitants. The fact that these remains are assigned to a remote period of Maori occupation by the natives themselves, considered in connection with the great distance between the lower and upper shell beds, goes far to prove that many centuries must have elapsed since the moa became extinct.

The fine collection of these huge creatures now at the Park represents a variety of genera. They were set up by Dr. Haast, and the trustees of the American Museum purchased them by telegraph, outbidding the agent of the British Museum. It is the most perfect collection extant. Their huge forms certainly tell a wondrous tale of the degeneracy of power in the march of time.—*C. F., in Evening Post.*

Petroleum.

The amount of crude petroleum produced has been steadily increased, with only two exceptions, from year to year, until it has reached 7,149,778 barrels in the first five months of the present year. At the same ratio for the balance of the year a production of 17,500,000 barrels will be obtained in 1879.

The rate of increase in the production has been, up to the present time (June 1st), about 315 per cent. The question of controlling the production has for all these years been one of the greatest importance to the trade; but all plans proposed and all attempts made in that direction have thus far proved ineffectual in restraining the producers from opening up new territories and producing the oil wherever found, without regard to the law of supply and demand, which every good business man is bound to respect and ready to apply in all other pursuits of life.

Taking it for granted that the production cannot be reduced while the Bradford field with its flowing wells tempts the operator, also while West Virginia, Kentucky, Tennessee, and California are attracting both the capitalist and the operator to their wonderful petroleum fields, which promise to rival Pennsylvania in the production of petroleum at no very distant day, it is apparent that the attention of all parties interested in the trade should be turned to and concentrated upon increasing the consumption of the product.

As a result of careful computation it has been ascertained that the exports of petroleum from the United States constituted about 66 per cent of the production, and that the home consumption required about 22 per cent more, making the total consumption 88 per cent of the production for the year 1878, leaving a surplus of 12 per cent. By concentrated action on the part of producers, shippers, and dealers, having in view the increase of consumption at home and abroad, the 12 per cent surplus, which is now increasing, the stock would soon be worked off at paying prices and a sound continuous market be secured for our present large production and to cover any increase in production that is likely to be obtained in the future.

A very important point to be considered in increasing the consumption is new uses to which the article may be applied; not forgetting, however, that its present uses as an illuminator, lubricator, and for fuel purposes should be extended and increased at home and all over the habitable globe.

The number of producing wells at the close of May was 11,045. Total production in May, 1,621,672 barrels. Daily average for the month, 52,312 barrels.

The shipments in May out of the producing regions were 195,281 barrels more than in the preceding month. The total shipments of crude, and refined reduced to crude equivalent, by railroad, river, and pipes to the following points were 1,331,469 barrels:

New York took	886,818	bbls.
Pittsburg "	108,456	"
Cleveland "	112,280	"
Philadelphia "	131,479	"
Boston "	8,238	"
Baltimore "	40,627	"
Richmond "		
Ohio River refiners took	13,161	"
Other local points "	30,410	"
Total shipments	1,331,469	

Included in the above shipments there were 128,149 barrels of refined from Titusville and Oil City, which is equal to 192,377 barrels of crude.

The stock in the producing regions has been increased during the month 290,203 barrels, making the total stock at the close of the month 6,956,814 barrels, and is held by pipe companies, tankers, and operators.—*Stowell's Petroleum Reporter.*

The Water Tower.

This invention of Mr. Logan, a practical machinist of Baltimore, having been brought to the attention of the New York Commissioners, they invited an exhibition in this city, and Chief Bates was instructed to furnish every convenience for a thorough test of the apparatus. The test was in every way satisfactory, and all who witnessed the operation of the machine, says the *Fireman's Journal*, expressed the opinion that it was a practical and desirable adjunct to fire departments.

The water tower consists of three sections of iron pipe mounted on a truck; these sections being fitted together horizontally are raised to a perpendicular position by turning a wheel, an operation easily performed by one man; at the upper end of the tower is a flexible play pipe, to which was affixed a 1¼ inch nozzle; at the base of the tower are connections for two lines of hose. Engine No. 20 was at a hydrant at Washington Square, and connected to the tower by two lines of hose. When water was first put through the hose, a coupling flew off and had to be sent to the repair shop to be readjusted. Meantime the steamer played through one line of hose, a splendid fire stream being projected through the tower, the nozzle of which was fifty-one feet above the ground. One man on the truck had perfect control of the stream, and by means of a simple gearing was able to depress or elevate the stream, or turn it in any direction, sweeping the horizon at all points and freely sprinkling the promiscuous crowd that had assembled. At a height of twenty-eight feet a branch pipe is placed and two streams were thrown at the same time, being handled with equal ease and facility by one man. Subsequently the tower was lowered and a short section substituted, having a 1½ inch nozzle and a height of thirty-seven feet. Two lines of hose were connected, and two streams thrown from the tower to a great height and a great distance horizontally.

The ease with which the machine was handled and its effectiveness excited the admiration of all beholders. Firemen, especially, were enthusiastic regarding it, but wanted to see one seventy instead of fifty feet high, and a 2 inch nozzle substituted for the smaller one. The advantages offered by this machine are the getting of a solid stream high in the air before it leaves the nozzle without the aid of ladders, and the ease with which it is controlled by one man. Of course no greater power is exerted than is furnished by the engines, but half a dozen streams could be siamesed into it if necessary. At the test the highest water pressure obtained was 170 pounds, while the owner claims that the tower will sustain a pressure of 300 pounds at the nozzle. As Commissioner King remarked, a 2½ inch stream delivered at that height under such pressure would be bound to make a black mark on any fire against which it was projected. It would also be of great value in "wetting down" buildings contiguous to a fire, as its range would enable it to sweep both sides of the street and keep the buildings wet from curb to cornice.

The Electric Light in Mining.

The first electric light employed in our Western mines was placed on the Deer Creek placer claim of the Excelsior Water Company at Smartsville, Nevada, on the 10th of last April. A 12,000 candle power Brush machine was put in operation, and three lights of 3,000 candle power each were placed in prominent positions upon the claim. Although the night was very dark the lights shed a brilliant light around and enabled the miners to work as readily as during the day. Until this experiment the mines had to shut down during the night, but now the company expects to work both night and day. Nevada and Yuba counties have many hydraulic mining companies, and several of them have announced their desire to use the new light if the Excelsior Company is thoroughly satisfied with their machine. The cost of lighting the claim by electricity is said to be 16 cents an hour.

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A Powerful Spectroscope.

In the young science of spectroscopy, as in others, an important element of progress is the improvement of instruments for dealing with the phenomena presented, and many minds are engaged on this. A new spectroscope of remarkable power has just been brought to the notice of the French Academy by M. Thollon. Its chief feature is the use of sulphide of carbon prisms, which are closed laterally, not by plates with parallel faces, but by prisms of the form of Amici's—*i. e.*, having curved sides meeting at an angle (which, however, is much smaller than Amici's prism). The refringent angles of these prisms are in an opposite direction to that of the sulphide prism. Two of these compound prisms are substituted by M. Thollon for the simple prisms in a spectroscope, which he formerly described to the Academy. Without going into further details, we may simply state that an enormous dispersion is obtained; with a magnifying power of 15 to 20 times, the spectrum has a length of 15 meters. The angular distance of the D lines of sodium is about 12′, whereas that produced by M. Gassiot was only 3′ 6″. This instrument should throw considerable light on the structure of the spectrum, and M. Thollon has already noticed some interesting facts. The lines of sodium and magnesium present a dark nucleus passing into a nebulosity, which becomes gradually merged in the continuous spectrum. Many lines have been split up, and all that have been thus resolved have been found to belong to two different substances. One of the hydrogen lines presents a nebulosity without a nucleus. M. Thollon remarks on the magnificence of the spectrum of carbon from the electric arc, observed with the new instrument. The spectra of iron, copper, and magnesium in the same arc were also seen with admirable clearness and brilliancy. These new spectroscopes have been constructed for M. Thollon by the able optician, M. Laurent.

Lighting the Capitol by Electricity.

The arrangements for lighting the capitol building with a new electric light are nearly completed. The experiment has already been made in the hall of the House of Representatives, and a single light placed on the front row of the reporters' gallery and over the Speaker's chair made the whole hall so light that print could be easily read at the points furthest from the burner. The plan is to place four lights in the hall, and it is now believed that they will be a very great improvement upon the present arrangement of gas burners.

Three electric machines have been purchased under the appropriations for lighting the interior of the building, and it is in contemplation to place another in position for the purpose of supplying a light of vast power upon the top of the dome. It is claimed by the inventors that a burner can be constructed there which shall have a very appreciable effect upon a large area of the city. It is claimed that with the steam power of the heating and ventilating apparatus in each wing of the building, a dynamo-electric machine of 175,000 candle power can be run.

Purification of Water.

During the hot weather, says the *Brewers' Guardian*, great care should be taken to insure a supply of pure water for brewing. Many of the organic contaminations which are quiescent and harmless in winter, become dangerously active in hot weather. Unless the water is naturally very pure, it should be artificially purified by filtration. Sand will mechanically remove impurities, but more than this is required; animal charcoal is perhaps the best filtering medium, but even this material will not completely remove all impurities. A quantity of scrap iron placed in the water will most effectually remove organic matter, but the water must necessarily be subsequently passed through a bed of sand and gravel to separate all the oxide of iron which is formed.

Welding of Nickel and Cobalt to Iron and Steel.

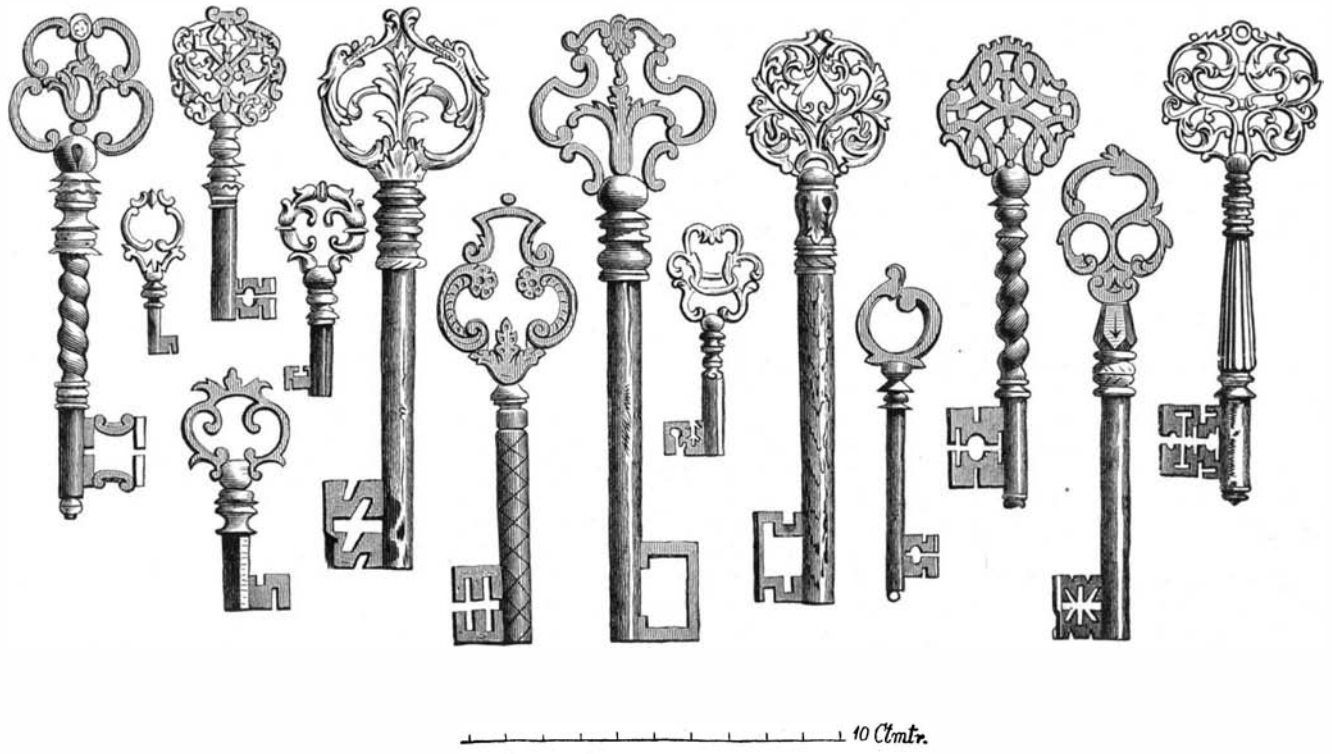
Herr. Fleitmann has succeeded in obtaining cast nickel in a malleable and ductile form, while cobalt prepared in the same manner possessed such hardness when cold that he thinks it could be used for cutting instruments, while hot it is both malleable and ductile. His process consists in adding to the fused metal, through a hole in the lid of the crucible, ⅛ per cent of metallic magnesium, which possesses a remarkable power of destroying carbonic oxide. Cobalt prepared in this manner possesses none of the reddish color attributed to it in the text-books, but excels nickel in whiteness and brilliancy. He also welded these metals to iron and steel at a white heat, and strips thus welded were rolled out to the finest number without separating from each other.

Advice to Bathers.

With a view of diminishing the loss of life which annually occurs from drowning, the Royal Humane Society of England issues the following seasonable advice to bathers: "Avoid bathing within two hours after a meal, or when exhausted by fatigue or from any other cause, or when the body is cooling after perspiration, and avoid bathing altogether in the open air if, after being a short time in the water, there is a sense of chilliness, with numbness of the hands and feet, but bathe when the body is warm, provided no time is lost in getting into the water. Avoid chilling the body by sitting or standing undressed on the banks or in boats, after having been in the water, or remaining too long in the water, but leave the water immediately there is the slightest feeling of chilliness. The vigorous and strong may bathe early in the morning on an empty stomach, but the young and those who are weak had better bathe two or three hours after a meal; the best time for such is from two to three hours after breakfast. Those who are subject to attacks of giddiness or faintness, and who suffer from palpitation and other sense of discomfort at the heart, should not bathe without first consulting their medical adviser."

ANCIENT KEYS.*

The engraving shows several keys from the Munich National Museum which belong to the 17th and 18th centuries. They are drawn half real size by Professor C. Reiss, of Stuttgart. The locksmith's art which, at the expense of decorative treatment, is almost entirely absorbed in our days by the complication of mechanism, showed itself formerly most particularly in the artistic form of the key. We find everywhere in museums and collections of industrial art a great number of specimens of most elaborate and delicate workmanship. This domain of small art, however restricted, is well worthy of attention.



KEYS FROM THE MUNICH NATIONAL MUSEUM.

Economical Steam Engine.

The Corliss engine at the French Exhibition of 1878 consumed only one kilogramme (2·2 lb.) of coal per horse power per hour. A similar engine of 700 horse power, constructed by M. Farcot, for the drainage at Asnières, consumes only six tenths as much. M. Tresca, in recommending, on behalf of the committee of the French Academy, that the Montyon prize should be awarded to the inventor of this engine, stated three special advantages which it possessed: A form of construction which establishes a great firmness between the cylinder and the chief arbor, with the least consumption of material; the separation of the orifices of admission and emission, to the great advantage of the permanence of temperature in the steam at its entrance into the cylinder; and a system of distribution commanded by a central platform for the four openings by means of springs and cams, which secure the opening and closing of the orifices. While claiming for Cavé the principle of separation between the orifices and conduits of admission and escape, the committee consider that Corliss' applications of the principle, the precision of action, and the economy of his engines entitled him to the Montyon prize of one thousand francs, and the Academy awarded the prize accordingly.

* From the *Workshop*. Willmer & Rogers News Company, agents, 31 Beekman street, New York.

On Public Speaking.

It may perhaps be of use to those anxious to become orators to know that from some cause or other almost all speakers occasionally not only lose the thread of their argument, but lose all knowledge of what they are talking about. I have seen this occur, says a writer in one of our English contemporaries, with many of our most experienced orators. When it happens they repeat a few vague generalizations until their thoughts come back to them, and then they fall back again into their speech. Thus their temporary wool-gathering escapes detection, except by those who watch them very closely. An inexperienced speaker, instead of doing this, pauses, gets confused, and sits down in despair. Another great mistake of budding speakers, and indeed of many who are in full bloom, is to speak too quickly. A person who wishes to be heard can hardly speak too slowly. He should pronounce not only each word, but every syllable of each word distinctly. Mr. Bright once said that nothing had cost him more trouble than to learn to speak slowly. A clear, deliberate utterance of every syllable, with pauses to mark the stops at the end of each sentence, does not produce the effect of tediousness, but the reverse.

A Long Trance.

The *British Medical Journal* reports a notable case of trance in the London hospital. The patient is a woman twenty-seven years of age, of rather small stature, and weak mental capacity. She was admitted on April 3, on account of symptoms connected with extensive disease of the heart, for which she had been treated as an in-patient in 1877. When admitted there was marked aphonia; she complained of great precordial pain, and frequently expressed her firm idea that "she was going to be married." At this time she had no difficulty in taking liquids; no marked nervous symptoms were present beyond the loss of voice. About May 7 prostration became marked, without any signs specially attributable to the heart disease, and she evinced great disinclination to take food of any kind. In a few days she fell rather suddenly into a state of trance, in which condition she has remained ever since. At first she could be induced with difficulty to take liquids, but soon she would not swallow even such food, and nutrient enemata had to be given. For a few days she would reply to questions by monosyllables, but later gave no sign of consciousness, remaining perfectly passive and motionless, and could not be roused. There was never any kind of convulsive seizure, local paralysis, or sign of any further lesion connected with the heart disease; the pulse remained full throughout. No reflex action was obtained on tickling the feet, and she seemed quite insensible to pricking or pinching the skin. The temperature remained normal. For three days she was fed by an elastic catheter passed through the nostrils to the pharynx—a proceeding which she made some attempt at resisting.

This condition differs from catalepsy in its lifelessness; but for the performance of the organic functions there is no muscular rigidity; the limbs, when raised, fall as if lifeless, and, if placed in certain attitudes, are not retained fixed as in catalepsy. At present the patient remains in the state described, giving no signs of consciousness; her condition appears to be exactly that of the famous Welsh fasting girl, and there is no sign of special disturbance resulting from her heart disease.

PHOTOGRAPHIC RIFLE.—M. Marey having expressed a wish for the invention of a photographic rifle which could take instantaneous views of birds in their flight, Capt. Eugene Vassel proposes a small dark rifle chamber of 2·27 inches interior diameter, surmounted by a proper level and sight. By means of Muybridge's, Janssen's, or other contrivances for taking instantaneous pictures, he thinks that small views might be easily taken which could be subsequently enlarged. He also proposes a photographic revolver for taking a series of successive attitudes at a single operation.—*La Nature.*

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Cotton Mills in South Carolina.

One of the most hopeful features of Southern industry is the effort making there to break up its purely agricultural character. A correspondent of the *Times*, who has been visiting the cotton mills of South Carolina, says that the advocates of Southern home industry are justly elated over the gratifying reports from the cotton mills in that State. Despite the general depression in business from various causes, among them yellow fever, last summer, the cotton goods increased in quantity and improved in quality, and found ready sales. The chief obstacle in the way of success was the scarcity of competent operatives, but with the aid of a few taken from Northern mills, a sufficient number of young native women and men have been taught to feed and direct the machines. They are furnished with neat cabins in the vicinity of the mills, and their pay ranges from 26 cents to $3 a day, according to their usefulness. The increase of local sales is specially noteworthy The Piedmont Company's books show the following profits on sales for the fiscal year ending March 31, 1879 New York, $9,401.58; Boston, yarns, $10,619.64; Baltimore, $7,180.12; local, $24,320.04; all other sources, $5,163.46. This, in proportion to the size and capacity of the other mills, is a fair exhibit for all.

The Langley Manufacturing Company was incorporated in 1870, with a capital of $450,000. Its mill is in the town of Langley, Aiken County, on the Charleston and Augusta Railroad. The main building is 229 by 104 feet, and the water power is equal to 580 horse power. The 10,880 spindles and 328 looms are operated by 325 mill hands. Four hundred and fifty bales of cotton are consumed monthly, which produce, on the average, about 598,000 yards of shirting, sheeting, and drilling. The president, W. C. Sibley, reports the trade brisk and prospects very encouraging.

The Glendale Mill, situated on the Enovee River, about six miles east of Spartanburg, is owned by a private firm, consisting of Messrs. Converse, Zimmerman & Twichell. The main building is five stories high, and measures 130 by 50 feet, and the side building is 60 by 40 feet, and three stories high. The mill consumes 40 bales of cotton weekly, and produces 50,000 yards of shirting, sheeting, and drilling during the same period. Five thousand spindles and 120 looms are daily fed and attended by 125 operatives. The water power at low water is estimated as equal to 250 horse power. Most of the goods manufactured during the fall, winter, and spring months are sold at home, but during the summer months the greater portion is shipped North and West. The present handsome structure was erected soon after the war in place of the old tumbledown factory which had occupied the site for 22 years. In reply to inquiries concerning business prospects, Mr. Converse said: "Trade has been better thus far this season than it was for five years. Up to May 1 we were ahead of production all the time, a great many of our goods being taken for export. We have about caught up with our orders, but have no accumulation."

The Reedy River Manufacturing Company's mill is on Reedy River, about four miles east of Greenville. The machinery is limited to 2,000 spindles and 48 looms, which, attended by 50 operatives, produce daily 2,500 yards of sheeting and 300 pounds of yarn. This company was organized in 1875 with a capital of $47,500. Its trade is almost entirely local, and, according to the superintendent's statement, very lucrative.

The Graniteville Manufacturing Company was organized in 1855. The advocates of home industry were less numerous at that time than they are now, and the company experienced some difficulty in obtaining a charter. Their establishment is situated on Horse Creek, in the town of Graniteville, and employs 240 operatives. The mill consists of 10,000 spindles and 300 looms, which produce monthly 360,000 yards of sheeting and drilling from 148,000 pounds of cotton. The water power is equal to 350 horse power. A short time ago the company also purchased 2,200 acres of land, and the water power used by the Vancluse Mill, burned in 1874, and built a new mill of granite and brick, which is being rapidly supplied with the most approved machinery, and will soon commence operations. The dam for this new mill is built of granite, and measures 342 feet in length. The expenses for the latter were paid from surplus funds and without an increase of the capital stock—which is $600,000. President Hickman reports trade very good for the season.

The Piedmont Manufacturing Company was incorporated three years ago with a paid in capital of $335,000. Its mill is on the Saluda River, on the Greenville and Columbia Railroad, about eleven miles from Greenville. Seventy-six snow white cottages, surrounded by neatly fenced gardens, inhabited by 275 operatives, line the main approach from Greenville for nearly half a mile, and present a very pleasing sight. The main building, containing 12,300 spindles and 380 looms, is three stories high and 256 feet long. About 18 bales of cotton are daily consumed, which produce, on the average, 16,000 yards of cloth and 2,300 pounds of yarn. The water power is unusually fine. It has been estimated that a pressure of 42,000 cubic feet of water per minute can be easily obtained, which would be amply sufficient to work 100,000 spindles. The company's books on March 31, 1879, exhibited surplus assests over all liabilities amounting to $36,869, and $56,684 gross profits for the preceding twelve months. Plans have been drawn and preparations are being made to erect another building without delay, which is to contain room and machinery for 15,000 more spindles.

The Camperdown Manufacturing Company commenced operations in 1874, with a capital of $300,000. Its machinery is distributed in two buildings—one two stories high and 206 feet long, and the other three stories high and 100 feet long—which are situated on Reedy River, almost in the heart of Greenville. The 13,000 spindles, attended by 260 operatives, produce, on the average, about 36,000 pounds of yarn weekly, from 100 bales of cotton. The mill produces a very superior yarn, much sought after in local markets. Bleaching and dyeing establishments—novelties in this section—have been recently added with gratifying results. Mr. Sandford, superintendent, reports business satisfactory.

The Westminster Thread Manufactory is owned by a machinist named Stribling and a few well-to-do farmers residing in the vicinity of Westminster—a small station on the Air Line Railroad, in Oconee County. They commenced operations about one year ago, in a two story wooden building, with a small capital. The machinery used is known as the Clement attachment, which transforms seed cotton into very superior thread. Various superiorities are claimed for this invention which are open to doubt, but nobody can dispute its labor-saving qualities. The laborious task of ginning and packing the cotton after it is picked is entirely dispensed with. The local demand exceeds the mill's production.

In addition to those already named, there are two more—the Saluda and Batesville factories: the former is near Columbia and the latter at Batesville, Greenville County. They produce about the same quantity and quality of goods as the Reedy River Mill. Both appear to prosper.

The Future of Copper Mining in New Mexico.

A correspondent of the New York *Times*, writing from New Mexico, says that an investigation of the copper resources of New Mexico leads to the belief that the depreciation in the value of copper which will follow the development of New Mexican mines will practically exclude the other mines in the United States—if not, indeed, the most of those in the world—from competing with that Territory.

One of the richest deposits is at Clifton, 93 miles almost due west from Silver City and between 60 and 65 miles from Ralston, now possibly better known as Coronado. The ore seems almost unlimited in quantity—in fact, there is a solid mountain of copper. To prove this, the first development was by tunnel at the base, and from which drifts were carried in all directions, shafts in the meantime being sunk from above, the ores from the top showing fully as rich as those at the bottom.

The smelting works and attendant buildings are in a cañon on the Fresco River, near where it empties into the Gila. Fuel has to be brought 35 miles and costs $40 a ton, one and a half tons being required to smelt a ton of copper. Cartage to the nearest railway station at Otero costs $70 a ton; yet the business is carried on at a large profit.

At Santa Rita, near Silver City, are extensive copper deposits, which have been worked for over a hundred years. While yet Mexican territory these mines were worked mainly by convict labor, and at times by hired natives. The deposits are of various kinds of copper ore and native copper in the seams of the rocks. It was for the latter that mining was carried on in former years. There is an abundance of rich ore over a large district, but at present the mines are in the hands of speculators and not being worked. The extreme difficulty of getting transportation for the metal to the end of the railroad has also, no doubt, had an important bearing upon the cessation of labor upon the mines. The ores of the Santa Rica and Hanover districts adjoining are in the form of immense deposits, and while rich, are unlimited in quantity. Further west, the Burro Mountains contain large deposits of copper, and still further, at Coronado, are several mines of great magnitude, of low grade ores, which cannot be worked at present for want of fuel and water. Up the Valley of the Rio Grande, and 18 miles east of Bernadillo, which is hardly more than 250 miles from the Colorado boundary, is the great copper district of the Puerto. Westward, and beyond the territorial line into Arizona, are copper deposits of much magnitude.

Quantity of Material in Buildings.

According to the *Northwestern Lumberman* 1,000 laths will cover 70 yards of surface, and 11 pounds of nails put them on. Eight bushels of good lime, 15 bushels sand, and 1 bushel hair make enough good mortar to plaster 100 square yards. A cord of stone, 3 bushels lime, and a cubic yard of sand will lay 100 cubic feet of wall. One thousand shingles, laid 4 inches to the weather, will cover 100 square feet of surface, and 5 pounds of nails fasten them on. One fifth more siding and flooring is needed than the number of square feet of surface, because of the lap in the siding and the matching of the floor. Five courses of brick will lay 1 foot in height on a chimney; 6 bricks in a course will make a flue 4 inches wide and 12 long; and 8 bricks in a course make a flue 8 inches wide and 16 long.

Depth of Earthquakes.

The recent earthquake at Virginia City was not noticed at all in the mining depths, but only by people on the surface. Their famous earthquake of some years ago, which shook down chimneys, fire walls, cracked brick buildings, and did other damage, was merely noticed by some of the miners working in the upper levels, but it did no damage, not even shaking down loose stones and earth. The station men in the various shafts felt it the strongest, and the deepest point where it was noticed was by the station tender at the 900 foot level of the Imperial-Empire shaft—900 feet below the surface. He said it felt like a sudden faint throb or pulsation of the air, as though a blast had been let off somewhere at a distance, above, below, or in some indefinite direction. In some of the mines the shock was not noticed at all, even by the station men. Commenting on this peculiar fact at the time, the Gold Hill *News* remarked that the earthquake seemed to be an electrical disturbance proceeding from the atmosphere and not from the depths of the earth.

Canal across the Isthmus.

The formation of a company to construct the great interoceanic canal across the Isthmus of Darien has been commenced. Of course M. De Lesseps is the prime mover. A first subscription of 4,000,000 francs is to be opened simultaneously all over the world next September. M. De Lesseps is confident that the amount of first subscription, 10 per cent of which is to be paid upon subscribing, will be more than covered. The charter of a company which has entered into arrangements with the Panama Railroad, and has obtained certain concessions from the Colombian Government, will be purchased as a preliminary measure. Mr. Nathan Appleton will be a director, and will open subscriptions in this country. It is the purpose of the company to make the loan a popular one, dispensing with government aid entirely. As at present contemplated, M. De Lesseps will, on the 1st day of January, 1880, break ground for the grand work of engineering.

The *Railway Review*, from which the above is taken, adds the following doubt regarding the success of the scheme:

We wish we might grow sanguine over the announcements, but we can only express hopefulness of the ultimate success of the enterprise. We know nothing of the arrangements made with the Panama road, alluded to above, but think it doubtful, if the real obstacle, the indemnity due the railroad, has been overcome. The contract existing between the road and the Colombian Government stipulates that no maritime canal to connect the two oceans shall be constructed without the concurrence of the railroad company. At least it amounts virtually to that, for it provides that such canal shall not be constructed in opposition to their wishes, without the payment to the company of a sum sufficient to indemnify them for damages and to pay them for their privileges as carriers on the Isthmus. If the sum demanded be deemed excessive a board of arbitration is provided for, the government to select one arbitrator and the railroad company another. In case of a failure to agree, the two arbitrators will select a third, whose decision will be final. An equitable arbitrament would, however, be unable to arrive at anything but an enormous figure, as, though the road would undoubtedly profit during the construction of the canal, after its completion its future would be distressingly problematical and millions of money would be irretrievably lost.

Electro-Measurement of the Hardness of Steel.

A new apparatus has been produced by Professor Wattenhofen, of Prague, for measuring the hardness of steel electro-magnetically. Its principle is that hardness of steel may be very correctly inferred from a numerical determination of its coercitive force. In its main features, his arrangement is as follows: From one end of a balance arm are suspended successively, in a brass holder, bars of the steels to be examined—those being as nearly as possible equal in weight. The other arm bends obliquely downward, and bears a constant weight. Motion of the beam causes a pointer to move radially over a scale, the movement being magnified by toothed wheels. One of the steel bars having been suspended, a magnetizing coil, equal to it in length, is raised on a stand so as to inclose the bar, and fixed with a binding screw when it does. Then a current is sent through the coil; then the coil is released and moved gradually down, pulling the bar with it, till the latter breaks away, and the deflection of the pointer is noted at which this occurs. This affords an estimate of the hardness of the steel. For example, a bar, A, gives a maximum attraction, 9·6; a second bar, B, 15·5; a third, C, 14·6. It is inferred that A is considerably harder than B and C, and of the two latter, C is harder than B. Precautions are taken in the apparatus to prevent injury to the parts from the sudden recoil when the hold of the coil on the bar ceases.

Preserving Cleopatra's Needle.

The London Metropolitan Board of Works recently took in hand the subject of preserving their Cleopatra's Needle, which had caused so much trouble to float to its destination. After consultation with experts it was decided to grant to one Henry Browning the job of cleaning and coating the monolith with a solution of his own invention.

The effect, says the *Times*, has exceeded the most sanguine expectations of the Board of Works. In operating upon the granite Mr. Browning first gave it a thorough cleansing, removing all the sooty and greasy matters from the surface, and indurated it with his invisible preservative solution. The effect has been to give a freshness to the granite as if only just chiseled from the rock, retaining the original color, disclosing the several veins, the white spar shining in the sun's rays like crystals, and exhibiting the polished portions as they formerly existed. More than this, the "intaglio," or the hieroglyphic engravings, come out far more pointedly than before, and the injuries the stone has received are now plainly distinguishable from the hieroglyphics. The solution soaks well into the pores of the granite, and the best authorities consider that it will have the effect of thoroughly preserving the monolith for centuries yet to come.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The best results are obtained by the Imp. Eureka Turbine Wheel and Barber's Pat. Pulverizing Mills. Send for descriptive pamphlets to Barber & Son, Allentown, Pa.

Steam Tug Machinery, Engines, Boilers, Sugar Machinery. Atlantic Steam Engine Works, Brooklyn, N.Y.

Wanted—Engineers and others to sell Barr's "Combustion of Coal." $5 a day made after working hours. Address Yohn Bros., Indianapolis, Ind.

A Quarry of Soap Stone and a Gold Mine for sale. A. H. McLaws, Georgia Land and Mining Agency, Augusta, Ga.

Parties wanted to interest themselves in a Patented Machine for giving an electric alarm at high or low water in steam boilers. Address W. I. Fancher, Glen Cove, N. Y.

Telephones repaired, and parts of same for sale. Address P. O. Box 205, Jersey City, N. J.

Wanted—Address of a Manufacturer of Silk Covered Wire, having facilities for furnishing in large quantities. Apply to C. Williams, Jr., 109 Court St., Boston, Mass.

The American Watch Tool Company, Waltham, Mass., can cut standard Taps and Screws from 1-100 of diameter upward, of any required pitch.

Five valuable Inventions for sale at $250 each. A fortune in either. For particulars, address John Decker, Ogdensburg, Sussex Co., N. J.

Book Cover Protector. (See this paper of March 1.) Sales 25,000 first month. Patent for sale, or can be made on royalty. Address Way & Rankin, 62 Fulton Street, Brooklyn, N. Y.

Steam Launch, 35 ft. by 7½ ft.; new last season; in complete order; for sale cheap. Address D. Chambers, Box 707, Yonkers, N. Y.

To Inventors.—Wanted to manufacture, a specialty in sheet iron work on royalty. J. G. Hibbs, Jr., Phila., Pa.

Wanted.—A 60 to 80 H. P. Engine, new or 2d hand; must be first-class. Address Baugh & Sons, Phila., Pa.

Renshaw's Ratchet (short spindle) uses taper and square shank drills. Pratt & Whitney Co., Hartford, Ct.

Champion Hay Conveyer; best in use. Rights for sale on reasonable terms. L. A. Greeley, Elmira, O.

Atmospheric Hammers, for sale, two, very cheap. Hill, Clarke & Co., Boston, Mass.

Improved Dynamo-Electric Machines for Electroplaters and Stereotypers. Price $75 for 150 gallon machine. Equal to the best, at half cost of the cheapest. J. H. Bunnell, Electrician, 112 Liberty St., New York.

For Sale Cheap.—4 Milling Machines, in good order. The Interchangeable Tool Co., 59 Hudson St., New York.

The Asbestos Roofing is the only reliable substitute for tin, it costs only about one-half as much, is fully as durable, is fireproof, and can be easily applied by any one. H. W. Johns' Manufacturing Company, 87 Maiden Lane, New York, are the sole manufacturers.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Rubber Belting, Packing, Hose, and all kinds of manufacturers' supplies. Greene, Tweed & Co., 18 Park Pl., N.Y.

The address of John Byrne, maker of the 4½ in. telescope, with which the companion of Sirius was recently seen, is 314 East 21st St., New York city.

Slate, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

H. Prentiss & Co., 14 Dey St., New York, Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

For Screw Cutting Engine Lathes of 14, 15, 18, and 22 in. Swing. Address Star Tool Co., Providence, R. I.

The Horton Lathe Chucks; prices reduced 30 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

Lincoln's Milling Machines; 17 and 20 in. Screw Lathes. Phœnix Iron Works, Hartford, Conn.

Boilers ready for shipment. For a good Boiler send to Hilles & Jones, Wilmington, Del.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 2,318 Frankford Ave., Phila.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Linen Hose.—Sizes: 1½ in., 20c.; 2 in., 25c; 2½ in., 29c. per foot, subject to large discount. For price lists of all sizes, also rubber lined linen hose, address Eureka Fire Hose Company, No. 13 Barclay St., New York.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & VanWinkle, Newark, N.J.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are being sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Partner wanted. See adv. on page 30.

Milling attachments for lathes. W. Main, Piermont, N Y.

Bradley's cushioned helve hammers. See illus. ad. p. 29.

Band Saws a specialty. F. H. Clement, Rochester, N.Y.

Improved Blind Staples. B. C. Davis, Binghamton, N.Y.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Excelsior Steel Tube Cleaner, Schuylkill Falls, Phila., Pa,

Vertical Burr Mill. C. K. Bullock, Phila., Pa.

Yacht Engines. F. C. & A. E. Rowland, N. Haven, Ct.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

Eclipse Portable Engine. See illustrated adv., p. 414.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Walrus Leather, Solid Walrus Wheels; Wood Wheels covered with walrus leather for polishing. Greene, Tweed & Co., 18 Park Place, New York.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

Best Power Punching Presses in the world. Highest Centennial Award. A. H. Merriman, W. Meriden, Conn.

Electro-Bronzing on Iron. Philadelphia Smelting Company, Philadelphia, Pa.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N.Y. Wm. Sellers & Co.

Having enlarged our capacity to 96 crucibles 100 lb. each, we are prepared to make castings of 4 tons weight. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

NEW BOOKS AND PUBLICATIONS.

NEUERE APPARATE FUR NATURWISSENSCHAFTLICHE SCHULE UND FORSCHUNG. 1te Lieferung gesammelt von M. Th. Edelmann. Stuttgart: Meyer & Zeller's Verlag (Fred. Vogel). 1879.

This publication, which will be complete in three volumes, of which the first has appeared, contains illustrations and descriptions of new and improved physical instruments, such as galvanometers, chronoscopes, hygrometers, inclinometers, etc. A carefuland very interesting description of the experiments made with the instruments, their results and applications, tend to make it very useful to all interested in exact and precise physical measuring and experimenting instruments.

DICKENS' DICTIONARY OF LONDON.

We are favored by the editor, Mr. Charles Dickens, with a copy of his new Dictionary of London. The work is more a guide book and encyclopedia of general information, than a dictionary, and visitors to London could scarcely have a more useful book of reference. It directs the stranger what places of interest to visit and how to reach them. It warns strangers against the tricks of confidence men, and tells them how to get rid of beggars. If the beggar is English, says Mr. Dickens, take no notice of him at all. He will follow you till you meet a more likely looking person, but no further. If your tormentor be an Italian, lift your forefinger knuckle upwards to the level of your wrist as it hangs by your side, and wag it twice or thrice from side to side. Your Italian who will take no other negative accepts that instantly. The whole of the information is given in a concise and interesting form, and the book is one of the cheapest shilling's worth published. It is issued at the office of "All the Year Round," Wellington street.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) H. C. asks: 1. What besides phosphorus will render articles luminous in the dark; that is, highly luminous? A. Canton's phosphorus, an anhydrous calcium sulphide, is sometimes used for this purpose, and the phosphorescence exhibited by it after exposure to sunlight compares very favorably with that of phosphorus. 2. Where can I get any information as to how the so-called fire kings handle heated rods, etc.? A. You may consult Pepper's "Playbook of Chemistry."

(2) J. H. asks (1) for a process for plating table cutlery, etc., with silver or a white alloy, and the necessary tools for doing the work. A. Such articles are commonly silver plated by connecting them with the zinc pole of a galvanic battery or negative electrode of a dynamo-electric machine, and suspending them for a short time in a bath composed of: water 1 gallon, potassium cyanide 12 ounces, and cyanide or chloride of silver about 1 ounce. The other pole of the battery or dynamo-electric machine is connected with a plate of pure silver, which is suspended in the bath facing the articles to be plated. Before placing in the bath the latter must be thoroughly freed from all traces of grease and other impurities. This is usually accomplished by boiling them in strong soda or potash lye, rinsing in running water, and scouring with pumice stone and potassium cyanide by means of suitable brushes, after which they are again quickly rinsed and immediately trussed in the bath without touching with the fingers. Before placing in the silver bath, however, it is customary to suspend them momentarily in a somewhat weaker ("striking") silver bath worked with a stronger current of electricity. 2. Also an explanation of the nickel plating process; will the crucibles used for one do for the other also? A. For the nickel plating process see article on p. 209, volume 38, SCIENTIFIC AMERICAN. Crucibles are not used in any of these operations.

(3) F. J. K. asks for recipe for making a black gloss (Japan ink). A. Borax, 1 part; shellac, 6 parts; boiling water, q. s.; color with soluble aniline black.

(4) H. S.—For electro-gilding baths see p. 2540, No. 160, SCIENTIFIC AMERICAN SUPPLEMENT. The following baths are used in electro-silver plating: Whitening or "striking" bath: potassium cyanide, 1 lb.; silver chloride (or cyanide), ¼ troy ounce; water (soft), 1 gallon; filter before using. Plating bath: potassium, 12 ounces; silver cyanide (or chloride), 1 troy ounce; soft water, 1 gallon; filter into a porcelain or glazed earthen vessel for use.

(5) W. N. G. asks for a glue that will fasten steel to wood firmly. A. Try one of the receipts recommended in No. 158 of SCIENTIFIC AMERICAN SUPPLEMENT.

(6) W. S. M. asks: What will cement bone and brass and be impenetrable to heat and water? A. See No. 16 in the list of cements, SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(7) H. S. writes: Can you journalize the following item? (Suppose I was the book-keeper for the firm of Smith & Brown.) A certain note for $2,000, drawn by James Jones, is deemed to be bad. In relation to this note Mr. Smith says to his partner; "I will sell my half interest in Mr. Jones' note for $500: do you know any one who will buy it?" Mr. Brown says: "Yes, sir, I will give you that sum for your half of the note." The note was in consequence indorsed over to Mr. Brown, and the bookkeeper was instructed to make the necessary entries. Now, then, what are the entries to be made in the journal? A. The problem you submit is: The firm of Smith & Brown hold a note made by Jones, for $2,000, said note being considered worthless. Smith sells his share to Brown for $500. What is the Journal entry on the firm's books? Ans. Loss and Gain Dr. to Bills Rec. Reason 1. When a note is known to be bad it should be taken from the Bills Rec. account, as that account will not then show the value of notes on hand. Reason 2. The firm parted with this note without consideration, hence it was a loss whether B. collects on it or not.

(8) F. S. D. asks: What cement is used to fasten in the sides of bisulphide of carbon prisms? It must of course be insoluble in the fluid. A. A melted mixture of good glue and concentrated glycerine, the composition used for inking rollers in printing presses, answers very well. See also the 3d and 4th receipts in the list in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(9) M. F. asks (1) for a receipt to make rubber cement to mend rubber belts or boots or any soft rubber goods. A. Dissolve 1 drachm of gutta percha in 1 ounce of bisulphide of carbon, filter through coarse filtering paper, add 15 grains of pure rubber, rub the whole smooth with a palette knife, taking care to do it quickly. If too thick, thin it with bisulphide of carbon. As this fluid is very volatile it should not be used in the vicinity of a fire or light. 2. Also a durable lacquer for finely polished and burnished brass. A. Seed-lac 3 oz.; turmeric 1 oz.; dragon's blood ¼ oz.; alcohol 1 pint. Digest for three or four days in a warm place, shaking it occasionally. Decant and filter. It is of a deep gold color.

(10) G. A. B. asks: 1. Does not the zinc consumed in an electric battery remain in the fluid? A. Yes. 2. If so, what are the different combinations formed with different acids? A. The acids combine with the zinc, forming zinc sulphate, nitrate, chloride, etc., as the case may be. 3. Are none of these of utility? These are marketable if purified. 4. Is it safe to evaporate the fluid over a kitchen fire? A. Generally, no. 5. Is an iron vessel suitable for the purpose? A. No; use a porcelain enameled iron vessel. 6. Can the powder remaining after evaporation be fused in an ordinary graphite crucible, and what heat is required? A. These salts are decomposed and partially votalilized at a red heat, impure zinc oxide remaining, if carbonaceous matters are not present.

(11) J B. R. asks for a receipt for making mead—McElree's—now sold in New York, or how to get one. A. Mead proper consists of a slightly fermented solution of honey in water. The mead sold at soda water fountains commonly consists of glucose (starch sugar) with a little cane sugar, boiled rice or starch water, and traces of various fruit juices.

(12) E. S. P. asks how to stiffen leather. A. Leather is somewhat stiffened by extracting the oily matters with bisulphide of carbon, and afterward immersing it for a short time in a hot cencentrated solution of zinc chloride, pressing and drying at about 220° Fah.

(13) H. A. D. writes: You speak of connecting Bunsen's battery direct to electric lamps. Could I attach 3 or 4 electric lamps to the same battery, or would I require separate cell for each lamp, and what would be the cost of running them per hour a single lamp? How many cells would it require per lamp? A. To produce a good light requires from 40 to 50 cells to each lamp. A current is produced much more economically by means of a dynamo-electric machine than with a battery.

(14) F. H. writes: Some time ago I saw directions for making a chemical lamp. Please tell me through your columns what you know of it and whether it will work. A. The phosphorus lamp referred to is a French toy of little practical value. It consists of a wide mouthed vial containing a few fragments of perfectly dry phosphorus dissolved in a small quantity of oil. When the vial is agitated and the stopper removed so as to admit fresh air, the film of oil adhering to the sides glows with a faint phosphorescent light visible only in a darkened room. In preparing the solution the oil may be heated in the bottle over a hot water bath and the fragments of dry phosphorus cautiously added. Occasionally agitate the bottle gently to insure the mixture of its contents.

(15) C. F. K. writes, in answer to H. S. P. and E. F. F.: 1. Of the thirty-six elements whose specific heat has been redetermined with great accuracy by Regnault and Kopp, thirty-one agree closely with the law of Dulong and Petit, and there are good reasons by which the discrepancy of some of the others may be explained. See Ad. Wurtz, "Dictionnaire de Chimie," i., p. 462. Still it is not pretended that the law is absolutely demonstrated. 2. Strange as it may seem, two and one sometimes do make two instead of three. It is a matter of experimental evidence that 2 vol. H + 1 vol. O make 2 vol. H_2O vapor. The accepted explanation is given in "Molecular Chemistry, No. 2." [For a more comprehensive treatment of the questions we refer H. S. P. and E. F. F. to pp. 131–134 *et seq.* and p. 191, of Prof. Josiah P. Cook's admirable popular treatise on "Chemical Philosophy,—"The New Chemistry"" also to Professor Remsen's late work on "Theoretical Chemistry."]

(16) G. W. S asks: 1. Is there any rule for setting the spring packing in an engine cylinder? A. There is no rule, but it is best to set them out no more than necessary to have them tight. 2. The engine is 14x20 inches cylinder, and boiler 54 inches in diameter and 16 feet long, 7-16 inch iron. Is it safe to carry 90 lb. steam pressure; we cannot do our work with less? A. Yes, if of good iron and in good order. Government inspectors' rule would allow you to carry much higher pressure. 3. Is there any liquid for cleaning brass, such as brass band horns? A. Dissolve 4 oz. of bichromate of potash in 1 pint of hot water; when cold, add slowly 3 oz. of sulphuric acid; as soon as the brass is cleaned, rinse, and polish with fine whiting. If the horn is in fair condition the acid solution should be diluted.

(17) E. R. asks: 1. How long will a good permanent magnet retain its magnetism, providing the armature is removed about once or twice every second? A. This treatment will speedily destroy a magnet. 2. After a magnet is weakened, will it return to its original strength if the armature is allowed to remain in contact with it for some time? A. It will improve if the weight of the armature be augmented daily, but it will take a long time for it to become strong. 3. Is there any difference in the wearing qualities of a permanent magnet with an armature, and a Bell telephone magnet with diaphragm, on account of the different conditions under which the armatures are removed from their respective magnets? If so, what is the difference? A. The magnet of the Bell telephone has an armature permanently attached to it, and is not, therefore, liable to become weakened. 4. How long will the magnet of a Bell telephone in average daily use last? A. With proper care we cannot see why it should ever fail.

(18) A. C. D. asks for recipe for the preparation to put on lamp wicks so they will not burn out. A. Steep them in a concentrated aqueous solution of tungstate of soda, and then dry thoroughly in an oven.

(19) M. G. writes: 1. I have 2 tanks, in which gas is compressed at 250 lb. per square inch. The first cylinder contains 30 feet, size 10 inches diameter by 30 inches height. The second cylinder contains 60 feet, size 10 inches diameter by 60 inches height. At what figure will the gauge show, when first charged, and at what figure, when 15 feet are used from the first, and 15, 30, and 45 feet from the second? A. At a constant temperature the tension of a gas is proportional to the pressure. Taking your figures the normal contents of the first tank would be $\frac{\sqrt{10} \times 7854}{1728}$ or about 1¼ cubic feet. 250 lb. per square inch equals about 16·6 atmospheres. At this pressure the tank in question would therefore hold 1¼x16·6—or about 21 cubic feet. In removing one half the gas you reduce the pressure one half, and so on. 2. Can the oxyhydrogen light be made any brighter, by substituting something else for the lime, or by some other means? A. Pure anhydrous magnesia yields a somewhat better light, but, unfortunately, it is too soft for practical purposes. Within certain limits the light may be increased by increasing the tension of the gases and (slightly) the aperture of the jet. Adjust the gases so that the tip of the blue inner cone of the flame is within 1-16 of an inch of the jet, and bring the surface of the lime as close to this as possible without touching the jet. If using the gases under considerable tension the lime cylinder must be turned frequently, as the mechanical action of the impinging gas is frequently sufficient to form cavities in soft lime which deflect the flame upon the jet to the injury of the latter.

(20) O. E. asks how to cover a smooth steel cylinder, ⅜ inch diameter by 6 inches long, with brass 1-16 thick all around, and get it to adhere, so I can cut a thread through the brass without danger of it loosening from the steel. A. You may do it by soldering a well fitted brass tube to the steel cylinder.

(21) R. E. H. writes: 1. An old gentleman while watching some hounds on the chase lately, and using a telescope of about two inch object glass, on raising the glass to his eye could hear the hounds plain when previously he could not hear them at all. The same result was reached on repeating the experiment and has been demonstrated several times since. Now is this fact that with a telescope to your eye you can hear sounds from the region towards which you are looking as much plainer as you can see objects clearer, generally known, and if so, what is the cause? A. The telescope does not affect the hearing in one way or the other. The fact that the hounds were more clearly heard when the telescope was used is due to the concentration of attention in that direction and to an extra effort at that particular time. Undoubtedly imagination has something to do with it. 2. If air is compressed to one half its original bulk, and then allowed to cool, how many units of heat will escape per given quantity? A. It depends upon the weight of air compressed. 3. Could a locomotive with small drive wheels run as fast by expanding its steam as one with large drivers, provided that the extra friction of machinery and wheels were not counted? A. Yes, up to the limit of safe velocity. 4. Is a vertical tubular boiler as safe as any kind to use in small yacht to run in very rough water? A. Yes, if properly proportioned and made. 5. Would there be danger with such a boiler to run into rough water suddenly after standing at wharf in harbor, and with the same is there danger of surcharged steam? A. Yes, if improperly constructed or injudiciously managed. 6. Is the water in the boilers of ocean steamers prevented from dashing into the engines by the height of the steam outlet, or are there other means? A. Yes, and sometimes division plates are fitted to check or control the movement of the water. 7. What are the principal difficulties in using steam on common roads, and has the reward of $10,000 offered by the State of Wisconsin for the best steam wagons yet been granted? A. Want of economy and liability to accident. We believe the premium has not yet been awarded. 8. Can you get more power with less weight

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by using very high pressure steam, and how high is it practically safe to carry it on the best boilers? A. Yes, carry as high steam as you please, and make your boiler of proportionate strength. 9. Can greater pressure with less weight be had from some form of pipe boiler or a stronger build of vertical tubular? A. Yes. 10. Are small boilers ever made of solid cast steel, and is it a valuable material to use for them? A. No.

(22) A. M. G. asks for a simple recipe for making the colored fire used so extensively in parlor theatricals, processions, etc.; the blue and the gold color especially are what he would like to know about. A.

	a green	*b* red	*c* yellow	*d* blue	*e* white
1 Potassium chlorate..	32·7	29·7	—	54·5	—
2 Sulphur	9·8	17·2	23·6	—	20·
3 Charcoal...	5·2	1 7	3·8	18·1	—
4 Barium nitrate.....	52·3	—	—	—	—
5 Strontium nitrate...	—	45 7	—	—	—
6 Sodium nitrate.. ...	—	—	9·8	—	—
7 Ammo. cop. sulphate	—	—	—	27·4	—
8 Potassium nitrate...	—	—	62.8	—	60·
9 Antimony sulphide.	—	5·7	—	—	5·
10 Flourygunpowder..	—	—	—	—	15·

It is hardly necessary to mention that great care is required in mixing these materials to avoid accident, and that each ingredient must be powdered separately. The substances must of course be free from moisture. These fires should never be used indoors, as the products of the combustion are very irritating, and, in some cases, very poisonous.

(23) "Farmer" asks (1) would not cotton seed oil be as good as linseed oil for common work, for preserving wood and preventing it from cracking? A. Probably not. It might be worth while to try comparative experiments. 2. Is there anything that can be applied to cotton seed to render them smooth and hard without injuring the germinating power of the seed? A. We know of no such substance.

(24) W. S. writes: In answer to a former query you stated that sodium was a monad metal and would combine with but one atom (of chlorine). Is it a monad only in this case? How do you explain the combination of sodium with from one to six atoms of carbonic acid? A. Hydrogen and sodium carbonate, hydrosodic carbonate, acid sodium carbonate, $NaHCO_3$ or $Na_2CO_3.H_2CO_3$, commonly called bicarbonate of soda, is prepared by passing a current of washed carbonic acid through solution of sodium carbonate. If the solution is concentrated the bicarbonate is deposited as a powder. It is, however, more advantageous to cause the carbonic acid to act upon a mixture of 1 part crystallized and 4 parts effloresced sodium carbonate. Sodium carbonate precipitates solution of magnesium sulphate, while the bicarbonate does not. From this reaction the point at which the conversion is completed may be readily ascertained. The so-called sesquicarbonate of soda (dibydro-tetrasodic carbonate—$Na_4H_2(CO_3)_3+2OH_2O$), remaining with the 9 equivalents of water displaced when carbonic acid acts upon the crystallized neutral salt, is regarded as a compound of the latter with the acid salt [$Na_2CO_3.2(NaHCO_3)$]. There is nothing in these reactions to indicate that sodium is other than a univalent element.

(25) W. C. R. asks: 1. What will take mildew out of canvas sails? A. Solution of calcium hypochlorite (bleaching powder) in cold water or vinegar. Use plenty of cold water afterwards. 2. Is there any way to prevent sails mildewing? A. Treatment with strong aqueous solution of alum or lead acetate (sugar of lead) answers very well.

(26) H. T. H. asks how to make printer's ink rollers, as it is too expensive to send to the north for them. A. They are usually made from glue and glycerine, glue and molasses, or a mixture of these. Take an equal quantity of good glue and concentrated glycerine; soften the former by soaking in cold water, then melt it over the water bath, gradually adding the glycerine Continue the heat until the excess of water has been driven off, meanwhile constantly stirring. Cast in brass or bronze moulds well oiled.

(27) W. E. S. writes: I made an electric telephone, as described in SUPPLEMENT, No. 142, like Figs. 1, 2, and 3, excepting I wound my magnet with more than ¾ oz. No. 36 wire. Would that make any difference in its working; mine fails to give the slightest sound? What is the matter with it? A. You do not give sufficient particulars to enable us to tell what prevents your instrument from working. We, however, suggest the following· Your connections may be defective. You may have clamped the two magnets between pieces of iron or steel. These pieces should be brass or wood, and the magnet poles which are placed against the soft iron helix core should be of the same name.

(28) W. F. M. writes: I have a couple of 200 bbl. pine tubs (new), and I wish to fill them with vinegar for storage. How can I fix them so that the vinegar will not taste of the pine or other bad taste? I wish to leave the vinegar in the tubs for five or six months. A. Melted resin (pale) is generally used, we believe.

(29) J. A. asks if a tank lined with the usual thickness of sheet lead is liable to corrode and leak. A. Lead is perceptibly acted upon by rain water, but such a tank, if properly constructed, will last many years without danger of leaking. The water stored therein should not be used for drinking or culinary purposes.

(30) E. V. C asks if a candle burning in a shaft in which there is occasionally bad air, on account of want of ventilation and powder smoke, increases or diminishes the bad air? The shaft is in a quartz lode. A. If the shaft is the only air passage to and from the works the candle so placed will not improve the ventilation.

(31) J. E. W. writes: I have a slated roof that leaks during heavy storms in an angle formed by an addition. Please give me a receipt for stopping the leak so that it will not be affected by the heat or cold. A. You may try red lead, followed by a good coating of genuine asphaltum varnish.

(32) F. T. W. writes: 1. I see in SCIENTIFIC AMERICAN, volume 37, page 72, that nitrate of ammonia is used for cooling water. How much of the ammonia will it take to cool three gallons of water? A 3 or 4 lb. of the salt will answer if properly used. The cooling is occasioned by the rapid solution of the salt, and ceases when complete solution is effected. 2. Which is the best to keep it in, a glass bottle or a tin can made for the purpose? A. The salt should be kept in a well stoppered glass bottle; tin will not answer,

(33) A. L. B. asks how to make the enamel lining to cast iron kettles, commonly called porcelain kettles. A. Grind together 100 parts of powdered calcined flints (or white quartz sand, free from iron), 50 parts of calcined borax (borax glass), and 20 parts of kaolin (white potter's clay), pass the mixture through an 80 mesh sieve, and mix it with water to form a thin paste. Line the clean vessel with this and let it dry slowly. Then fuse together 125 parts of white glass, 25 of borax, and 20 of soda; powder when cold, and make into a thin paste with 4 parts of soda and a sufficient quantity of hot water. Cover the first coating with this, and, after thoroughly drying, heat in a muffle until the glazing has properly fused.

(34) H. W., Jr., asks what is the meaning of the word ebonite? A. Ebonite is a variety of hard rubber—made by exposing gum rubber (caoutchouc) mixed with about half its weight of sulphur to a temperature of about 300° Fah., under pressure. See pp. 48 and 105, volume 39, SCIENTIFIC AMERICAN.

(35) G. K. asks if there is any book published on metals which treats of their fusibility and other properties, also of alloys. A. Consult Guthrie's "Metallic Alloys," and Byrne's "Practical Metal Worker's Assistant."

(36) L. C. R. writes: I have often been puzzled to know the origin of the names used to designate the different sizes of nails; 8 penny, 10 penny, etc., and have never heard any answer that seemed satisfactory. The statement that the numbers are based on the number of pounds in weight of a thousand nails of each size, would, if proved to be correct in the matter of weight, still not satisfy the penny. A. We have no doubt the term "penny" means "pound" in this connection, and that nails were originally made so that 4 penny nails weighed 4 lb. per thousand, 10 penny nails weighed 10 lb. per thousand, and so on.

(37) W. K. B. & S. write: We have a Leclanche battery which has been in use for 4 months, with two electric call bells. It has become very weak. What shall we put in it to make the bells strong? A. Put a handful of salammoniac crystals in each cell and fill up with water. If this does not help them, remove the carbon and the black oxide of manganese from the porous cells, clean the carbons and the cells, and refill the latter with fresh black oxide of manganese.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. R. C. & Co.—The fossiliferous rock contains about 14 per cent of iron and a notable quantity of lime phosphate.—X. Y. Z.—1 and 3. Fossiliferous limestone. The other samples are chiefly dolerite with a small quantity of hematite.—S. C.—It is a sample of fine bituminous coal. The property will doubtless prove valuable.—W. D.—Partially decomposed iron pyrites associated with arsenopyrite.—S. B. T.—Lead sulphide (galena) a valuable ore of lead.—W. K. I. B.—It is a trap rock, containing nothing of value.—H. S.—It is the petroleum jelly called vaseline—a product of petroleum.

COMMUNICATIONS RECEIVED.

On Economical Brewing. By J. O. B.
On Foot Lathes for Watch Work. By W. F. A. W.
On Theory of the Universe. By H. C.

[OFFICIAL.]

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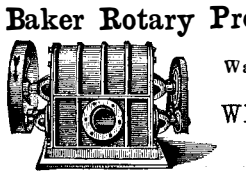

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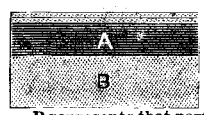

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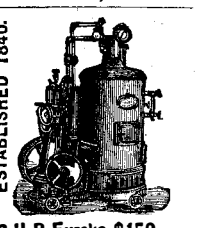

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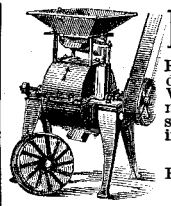

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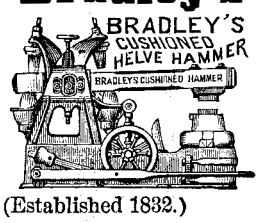

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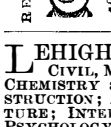

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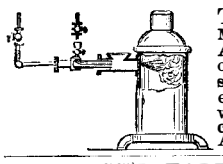

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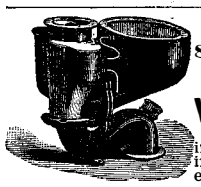

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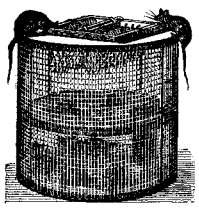

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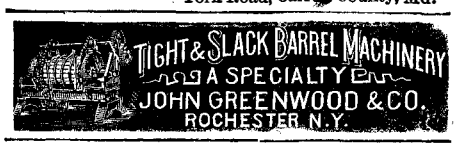

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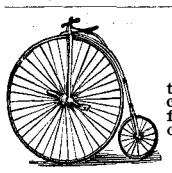

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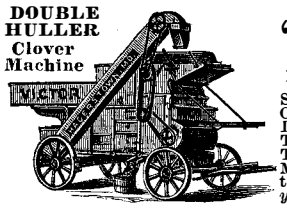

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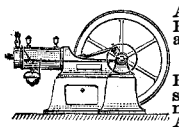

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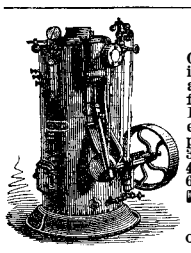

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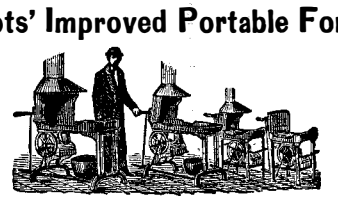

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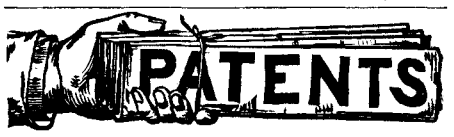

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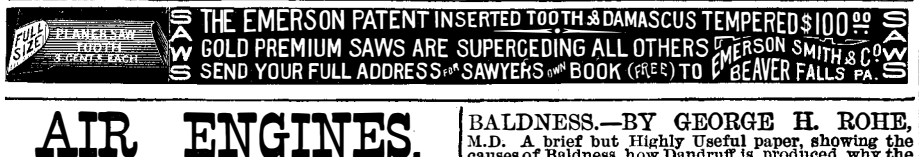
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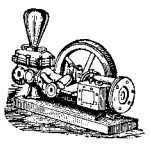

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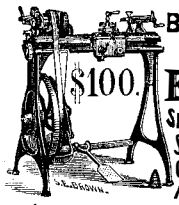

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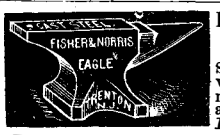

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